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NASA TECHNICAL MEMORANDUM

NASA TM-78313

FY 1980 SCIENTIFIC AND TECHNICAL REPORTS,
ARTICLES, PAPERS, AND PRESENTATIONS

Compiled by O. L. White
Management Services Office

October 1980



NASA

*George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama*

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FOREWORD

In accordance with the NASA Space Act of 1958 the MSFC has provided for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

Since July 1, 1960, when the George C. Marshall Space Flight Center was organized, the reporting of scientific and engineering information has been considered a prime responsibility of the Center. Our credo has been that "research and development work is valuable, but only if its results can be communicated and made understandable to others."

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GEORGE C. MARSHALL SPACE FLIGHT CENTER
Marshall Space Flight Center, Alabama

**FY 1980 SCIENTIFIC AND TECHNICAL REPORTS,
ARTICLES, PAPERS, AND PRESENTATIONS**

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TM-78235* **January 1980**
Space Processing Applications Rocket
Project SPAR IV Final Report. Com-
plied by Fred Reeves. N80-19173

The Materials Processing in Space (MPS) Program is stimulating the scientific use of the effects of the unique aspects of the space environment on material processes. The reduction of the pervasive influences of gravity on Earth-based processes provides opportunities for a basic understanding and improvement in many processes. Initial demonstrations of such scientific principles were accomplished on Apollo, Skylab, and Apollo-Soyuz flights. During the period between that era and the era of routine orbital space flight on the Space Shuttle in the 1980's, the Space Processing Applications Rocket (SPAR) Project is providing the only scientific flight opportunities for experimenters.

The Black Brant rockets which are used to lift the scientific payload, provide a duration on the order of five minutes of low gravity (coasting) time during the suborbital flight. SPAR also affords experimenters and apparatus developers an opportunity to check out concepts, equipment and procedures before the longer term and more extensive flights on the Shuttle. This report describes the results of SPAR IV, the fourth rocket flight in a series of nine planned flights.

Previous experiments on the first three SPAR flights involved the measurement of liquid mixing due to spacecraft motions and the dispersion of normally immiscible liquids in the area of fluid mechanics. In the area of solidification, experiments were made on the effects of gravity on dendritic growth, epitaxial growth and the eutectic point of materials with widely differing densities. In the area of multiphase particle interaction, experiments were made on the migration and

coalescence of bubbles and particles, closed-cell metal foam and dispersion strengthening of composites. Finally, in the new area of containerless processing, an experiment on the melting and solidification of Beryllium in an electromagnetic field was accomplished.

TM-78240 **August 1979**
Summaries of Early Materials Processing
in Space Experiments. Robert J. Nau-
mann and E. Darby Mason. Space Sci-
ences Laboratory. N79-33226

Objectives, methods, and results of low-gravity materials processing experiments are summarized, and a bibliography of published results for each experiment is provided. Included are drop tower experiments, the Apollo demonstration experiments, the Skylab experiments and demonstration experiments, and the Apollo-Soyuz experiments and demonstrations. The findings of these experiments in the fields of crystal growth, metallurgy, and fluid behavior are summarized.

TM-78241 **October 1979**
Development and Evaluation of an
Ablative Closeout Material for Solid
Rocket Booster Thermal Protection
System. W. J. Patterson. Materials and
Processes Laboratory. N80-13258

A trowellable closeout/repair material designated as MTA-2 (Marshall Trowellable Ablator) has been developed in-house at Marshall Space Flight Center and has been evaluated for use on the Solid Rocket Booster. This material is composed of an epoxy-polysulfide binder and is highly filled with phenolic microballoons for density control and ablative performance. The MTA-2 material has been evaluated by mechanical property testing as well as thermal testing in a wind tunnel to simulate the combined Solid Rocket Booster trajectory aeroshear and

*See notation page 17.

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Rocket Booster trajectory aeroshear and heating environments. This material is characterized by excellent thermal performance and has been used extensively on the Space Shuttle STS-1 and STS-2 flight hardware.

TM-78242 September 1979
The Economics of Project Analysis:
Optimal Investment Criteria and Methods of Study. Marc C. Scriven. Project Planning Office. N79-34093

The purpose of this study is to provide insight toward development of an optimal program for investment analysis of project proposals offering commercial potential and components thereof. This involves a critique of economic investment criteria viewed in relation to requirements of engineering economy analysis. An outline for a systems approach to project analysis is developed. Application of the Leontief input-output methodology to analysis of projects involving multiple processes and products is investigated. Effective application of elements of neoclassical economic theory of investment analysis of project components is demonstrated. Patterns of both static and dynamic activity levels are incorporated in the study.

TM-78243** August 1979
Development and Testing of the Solar Control Corporation Modular Controller and Solarstat Subsystem - Final Report. James D. Hankins. Solar Energy Applications Projects. N80-14498

This document summarizes the final results of contract NAS8-32258 Solar Control Corporation, for the additional development work on their existing Controller and Solarstat Subsystem for use with solar heating and cooling systems. It discusses the intended use of the final report, describes the deliverable end items, lists program objectives, and relates how they were accomplished.

The report shows that the products developed are marketable and suitable for public use.

TM-78244** August 1979
Development and Testing of the Sun-keeper Control Corporation Integrated Programmable Electronic Controller and Hydronics Package. James D. Hankins. Solar Energy Applications Projects. N80-14495

This document summarizes the final results of contract NAS8-32257 with Sun-keeper Control Corporation (now Andover Controls) of Andover, Massachusetts for the additional development work on their existing programmable electronic controller and hydronic package for use with solar heating and cooling systems. It discusses the intended use of the final report, describes the deliverable end items, lists program objectives and relates how they were accomplished.

The report shows that the products developed are marketable and suitable for public use.

TM-78245** October 1979
Development, Testing and Certification of the Sigma Research, Maxi-Therm S-101 Thermosyphon Heat Exchanger - Final Report. James D. Hankins. Solar Energy Applications Projects. N80-14499

This report is intended to provide product development information as an aid to the solar systems manufacturing industry in their effort to determine the product adaptability for use in a specifically configured solar heating system in residential and commercial applications.

This report will also serve as an aid to those who desire to remain abreast of the state-of-the-art of solar energy heating and cooling projects.

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The Maxi-Therm S-101 is a thermosiphon liquid-to-air heat exchanger for use in heating systems in residential single-family dwellings and small commercial applications. It is a pumpless heating module which, when attached to a water storage tank, comprises a self contained heating unit. Electric resistance heating elements can be installed in the storage tank to provide a backup or off-peak heating system.

At the completion of the development contract, Sigma Research obtained certificates from professional engineers and test laboratories that the Maxi-Therm S-101 meets or exceeds performance specifications, performance criteria and applicable standards and codes.

TM-78246** October 1979
Development and Testing of the Rho Sigma, Inc., Microprocessor Control Subsystem - Final Report. James D. Hankins. Solar Energy Applications Projects. N80-14496

This document summarizes the final results of Contract NAS8-32256 with Rho Sigma, Inc., Van Nuys, California, for the additional development work on their existing programmable electronic controller for use with solar heating and cooling systems. It discusses the intended use of the final report, describes the deliverable end items, lists program objectives, and relates how they were accomplished. The products developed are marketable and suitable for public use.

TM-78247 September 1979
Thermally Grown Oxides and Diffusions for Automatic Processing of Integrated Circuits. Bobby W. Kennedy. Electronics and Control Laboratory. N80-70763

This report presents a discussion of thermally grown oxides and diffusions for

automatic processing for integrated circuits including the wafer carrier and loading from a receiving air track into automatic furnaces and unloading on to a sending air track.

TM-78248 October 1979
Conceptual Development of the Laser Beam Manifold (LBM). Warren Campbell and Robert B. Owen. Space Sciences Laboratory. N80-16322

The Laser Beam Manifold is a new device for transforming a single, narrow, collimated beam of light into several beams of desired intensity ratios; e.g., all of the outgoing beams might be of the same intensity. The Laser Beam Manifold's function is similar to that of a beam splitter, but the Laser Beam Manifold divides the beam into several rather than only two beams. The device consists of a single optical substrate with a metallic coating on both optical surfaces. By changing the entry point, the number of outgoing beams can be varied.

TM-78249 September 1979
Radiative and Free Convective Heat Transfer from a Containerless Sphere. Karen Johnson. Space Sciences Laboratory. N80-11377

A mathematical model is derived for heat loss due to radiation and free convection for a small copper sphere (approximately 0.3 to 0.4 cm diameter) cooled by a helium-argon gas mixture. A FORTRAN program written to simplify calculations and extend the range of applicability to experimentation is presented. Pressures used were less than 400 torr, and resulting temperatures ranged from 500 to 4600 K. Comparison of results for initial cooling by the gas mixture with experimental data showed a 5 percent error for temperature values and a 2.7 percent error for the temperature difference caused by the cooling. Accuracy could be increased significantly by using better estimates for thermal conductivities.

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TM-78250

October 1979

FY 1979 Scientific and Technical Reports, Articles, Papers, and Presentations. Compiled by O. L. White. Management Services Office, Administration and Program Support. N80-17014

This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY79. It also includes papers of MSFC contractors.

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The information in this report may be of value to the scientific and engineering community in determining what information has been published and what is available.

TM-78251**

September 1979

A Computer Program for Assessing the Economic Feasibility of Solar Energy for Single-Family Residences and Light Commercial Applications. J. Alan Forney, David Walker, and Mile Lanier. Cost Analysis Office. N80-14501

The technical feasibility of utilizing solar energy to meet domestic, space heating and hot water loads for single family residences and light commercial applications has been clearly demonstrated. However, the economic feasibility is a complex problem requiring subjective judgments of the future value of key economic parameters, particularly conventional fuel escalation rates. In simplest terms, the prospective installer must decide whether he is willing to spend money now (to install a solar heating system) in order to save money later (lowered conventional fuel bills in the future).

This report describes a computer program (SHCOST) used to perform economic analyses of the Operational Test Sites managed for DOE by MSFC as part of the National Solar Heating and Cooling Development Program. The computer program is user oriented and allows consideration of only the economic parameters which are important to the user problem. A life cycle cost and cash flow comparison is made between a solar heating system and a conventional system. The program assists in sizing the solar heating system. A sensitivity study and plot capability allow the user to select the most cost effective system configuration.

TM-78252

November 1979

**Torque Equilibrium Attitude Control
for Skylab Reentry. John R. Glaese and
Hans F. Kennel. Systems Dynamics
Laboratory. N80-14169**

Deliberate relocation of the Skylab foot-print (to lower the chances of injury or damage) required controlling to a high-drag and a low-drag attitude (with a transition capability from one to the other at any time) to an altitude below 150 km (80 n.mi.).

However, the Skylab attitude control system was designed for holding a solar inertial attitude (temporary Earth-pointing was possible at the expense of cold-gas thruster fuel) at an altitude (435 km or 235 n.mi.) where the gravity gradient torques were predominant and the aerodynamic torques were practically negligible.

To control Skylab to below 150 km (where the aerodynamic torques were 10 times higher than the gravity gradient torques), without the use of thruster fuel (once the attitude was established), required the design, development, and software implementation of a completely new method: Active seeking of a torque equilibrium attitude.

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This report describes all the available torque equilibrium attitudes (most were useless from the standpoint of lack of electrical power), the equilibrium seeking method, as well as the actual successful application during the 3 weeks prior to Skylab reentry.

TM-78253

November 1979

Characterization of Three Types of Silicon Solar Cells for SEPS Deep Space Missions. A. F. Whitaker, S. A. Little, C. F. Smith, Jr., and V. A. Wooden. Materials and Processes Laboratory.

N80-15562

Three types of high performance silicon solar cells, BSF/BSR 10 ohm-cm, BSR 10 ohm-cm and BSR 2 ohm-cm, manufactured by Optical Coating Laboratories, Inc., have been evaluated for their low temperature and low intensity performance. Sixteen cells of each type were subjected to ten temperatures and nine intensities. The BSF/BSR 10 ohm-cm cells provided the best performance at 1 solar constant and +25°C with an efficiency of 14.1 percent while the BSR 2 ohm-cm cells had the highest low temperature and low intensity performance with an efficiency of 22.2 percent at 0.04 solar constant and -170°C and the most consistent cell-to-cell characteristics.

TM-78254

January 1980

The Stratigraphic Sequence of Volcanic and Sedimentary Units in the North Polar Region of Mars. Michael E. Botts. Space Sciences Laboratory.

N80-17004

Based on photogeologic mapping of Viking Orbiter images of Mars, four distinct informal stratigraphic units can be defined for the region north of 70°N latitude. They are: (a) bulbous plains, (b) mantled plains, (c) dune deposits, and (d) layered deposits/perennial ice.

The bulbous plains unit underlies all other north polar units and represents a sub-unit of the mottled cratered plains. Based on crater size-frequency data, bulbous plains are equivalent in age to the relatively old cratered plains unit at Tempe Plateau (90°W, 30°N). The low albedo of bulbous plains and the appearance of what appears to be a dike suggest that bulbous plains has a volcanic origin. Cumulative crater size-frequency distribution functions for bulbous and mantled plains display two-segment curves with a crater-production slope of -2.0 and a cratering-obliteration equilibrium slope of -0.7. This supports the interpretation that mantled plains were formed by dust blanketing of bulbous plains. As calculated from crater size-frequency distribution functions, the relative surface-obliteration rates are 1:9:88 for bulbous, moderately mantled, and heavily mantled plains, respectively.

The layered deposits probably represent a facies of mantled plains in which dust has been deposited onto the perennial ice cap rather than directly onto the ground. Thus, the areal extent of the layered deposits at the north and south poles may indicate the maximum extent of the perennial ice caps as controlled by changes in Martian orbital parameters.

Dune deposits occur in the form of longitudinal, transverse, and barchan dunes, and possibly as sheet sand deposits. Actual dunes are generally confined to mantled plains, suggesting that mantling provides a proper substratum for dune accumulation.

Surface winds for the north polar region were determined from dune orientations to flow predominantly counterclockwise around the polar cap, although there is evidence for dune modification by secondary winds spiralling clockwise off of the cap.

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A gradation from densely spaced transverse dunes to more dispersed barchan and transverse dunes implies a general thinning of circumpolar dune deposits downwind of extensive areas mapped as bulbous plains. The author suggests that dune material is being stripped from bulbous plains and is accumulating as dunes downwind on mantled plains.

TM-78255 December 1979
Prosthetic Device for Correction of
Urinary Incontinence. Ray Helms. Structures and Propulsion Laboratory.
N80-16739

This report documents how the development of a prosthetic device for the correction of urinary incontinence originated from aerospace technology and the status of this ongoing project. It is anticipated that there will be a follow-on publication at the conclusion of NASA's participation on this project.

TM-78256 December 1979
AVE-SESAME I: 25-MB Sounding Data, Myron L. Gerhard, Henry E. Fuelberg, Steven F. Williams, and Robert E. Turner. Texas A&M University and St. Louis University. N80-16683

This report describes the rawinsonde sounding program for the AVE-SESAME I experiment and presents tabulated data at 25-mb intervals from the surface to 25 mb for the 23 National Weather Service and 19 special stations participating in the experiment. Soundings were taken at 3-hr intervals beginning at 1200 GMT on April 10, 1979, and ending at 1200 GMT on April 11, 1979 (nine sounding times). The method of processing is discussed briefly, estimates of the rms errors in the data presented, an example of contact data given, reasons given for the termination of soundings below 100 mb, and soundings listed which exhibit abnormal characteristics.

TM-78257 January 1980
Stress Corrosion Cracking Evaluation of Martensitic Precipitation Hardening Stainless Steels. T. S. Humphries and E. E. Nelson. Materials and Processes Laboratory. N80-16142

This report gives the results of a comprehensive investigation of the stress corrosion cracking resistance of the martensitic precipitation hardening stainless steels PH13-8Mo, 15-5PH, and 17-4PH. Round tensile and c-ring type specimens taken from several heats of the three alloys were stressed up to 100 percent of their yield strengths and exposed to alternate immersion in salt water, to salt spray, and to a seacoast environment. The results indicate that 15-5PH is highly resistant to stress corrosion cracking in conditions H1000 and H1050 and is moderately resistant in condition H900. The stress corrosion cracking resistance of PH13-8Mo and 17-4PH stainless steels in conditions H1000 and H1050 was sensitive to mill heats and ranged from low to high among the several heats included in the tests. Based on a comparison with data from seacoast environmental tests, it is apparent that alternate immersion in 3.5 percent salt water is not a suitable medium for accelerated stress corrosion testing of these PH stainless steels.

TM-78258 December 1979
Solid Rocket Booster Thrust Vector Control Subsystem Verification Test (V-2) Report. Boris Pagan. Structures and Propulsion Laboratory. N80-17139

This report presents the results of the verification testing sequence V-2 performed on the Space Shuttle Solid Rocket Booster Thrust Vector Control (SRB TVC) subsystem by the Marshall Space Flight Center, Huntsville, Alabama. These tests were performed between January 1978 and April 1979, per SE-019-098-2H, SRB TVC Overall Systems Test Requirements.

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A detailed history of the hot firings plus additional discussion of the Auxiliary Power Unit (APU) and the hydraulic component performance is presented. In addition, the test objectives, data, and conclusions are included for general information.

TM-78259 December 1979
Space Shuttle Solid Rocket Booster
Cost-Per-Flight Analysis Technique. J.
Alan Forney. Systems Analysis and
Integration Laboratory. N80-17133

The National Aeronautics and Space Administration Space Shuttle is designed as a lost cost payload delivery system to Earth orbit. Each Shuttle launch consists of the payload carrying Orbiter, an expendable External Tank and two reusable Solid Rocket Boosters. Low cost-per-flight is a major Space Shuttle program goal. The Solid Rocket Booster is the most expensive recurring cost element of the reusable space transportation system. Periodic replacement of damaged or worn-out SRB components is necessary to maintain an adequate inventory to sustain the projected 500-flight, 12-year traffic model. Determining new SRB hardware requirements and the associated costs requires consideration of: traffic model, component attrition, hardware useful life, turnaround time for refurbishment, manufacturing rates, learning curves on the time to perform tasks, cost improvement curves on quantity hardware buys, inflation, spares philosophy, long lead hardware funding requirements and other logistics and scheduling constraints. A Cost-Per-Flight computer model is described which considers these factors and is used at Marshall Space Flight Center for operations planning and budgeting. Additional uses of the model include assessing the cost-per-flight impact of changing major Space Shuttle program parameters and searching for opportunities to make cost effective management decisions.

TM-78260 January 1980
Finite Element Models of the Space
Shuttle Main Engine. G. R. Muller. Sys-
tems Dynamics Laboratory. N80-17140

This report documents the culmination of a 2 year effort from May 1976 to April 1978 to develop finite element models as input to dynamic simulations of the High Pressure Fuel Turbopump (HPFTP), the High Pressure Oxidizer Turbopump (HPOTP), and the Space Shuttle Main Engine (SSME).

Descriptions are provided for the five basic finite element models: HPFTP rotor, HPFTP case, HPOTP rotor, HPOTP case, and SSME (excluding turbopumps).

Model results are presented for the HPFTP rotor, HPFTP case, coupled HPFTP rotor and case, HPOTP rotor, HPOTP case, coupled HPOTP rotor and case, SSME (excluding turbopumps), and SSME (including turbopumps).

Results for the SSME (including turbopumps) model are compared to data from a SSME HPOTP modal survey conducted at the NSTL, Bay St. Louis, Mississippi.

TM-78261 February 1980
Nighttime/Daytime Optical Survey of
Lightning and Convective Phenomena
Experiment (NOSL). Bernard Vonnegut,
Otha H. Vaughan, Jr., and Marx Brook.
Space Sciences Laboratory. N80-18608

The Nighttime/Daytime Optical Survey of Lightning (NOSL) experiment has been selected for flight on Orbital Flight Test 2 (STS-2) of the Space Shuttle. This report presents the background and rationale for the experiment and describes the experiment hardware, the operating procedures, and the data analysis technique. Some preliminary

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results from the prototype hardware development are also presented.

TM-78262 February 1980
A Preliminary Look at AVE-SESAME I
Conducted on April 10-11, 1979. Steven
F. Williams, James R. Scoggins, Nicholas
Horvath, and Kelly Hill. Space Sciences
Laboratory. N80-18636

This report contains information on data collected, synoptic conditions, and severe and unusual weather reported during the AVE-SESAME I period. The information presented is preliminary and incomplete. The purpose of the report is to provide to researchers a preliminary look at conditions during the AVE-SESAME I period.

TM-78263 January 1980
Induced Radioactivity in Recovered
Skylab Materials. G. J. Fishman and
C. A. Meegan. Space Sciences Laboratory.
N80-18904

Four radioactive isotopes have been found in aluminum and stainless steel samples from Skylab debris recovered in Australia. The low-level activity was induced by high-energy protons and neutrons in the space environment. Measurements of the specific activities are given.

TM-78264 January 1980
Infrared Scanner Concept Verification
Test Report. F. D. Bachtel. Structures
and Propulsion Laboratory. N80-18367

This document presents the test results from a concept verification test program conducted to assess the use of an Infrared Scanner as a remote temperature sensing device for the Space Shuttle program. The Infrared Scanner would be used during pre-launch operations to determine the surface

temperature of the External Tank, which contains the cryogenic propellants for the Shuttle Main Engines. The surface of the External Tank is a Spray On Foam Insulation (SOFI) used to thermally insulate the tank and control boiloff of the cryogenic propellants. Under certain weather conditions ice or frost accumulations are likely on the insulation surface, the temperature of which can be significantly below freezing. The Infrared Scanner would be used to assess possible ice/frost accumulations by mapping the insulation surface temperature to detect freezing areas on the tank. The subject test program was conducted during the Fall of 1979 to determine the feasibility of this concept. A total of 127 tests were performed using a typical 8 to 12 micron Infrared Scanner and simulated External Tank surfaces. Areas of investigation included temperature and geometric resolution limits, atmospheric attenuation effects including conditions with fog and rain, and the problem of surface emissivity variations. It was concluded that the basic concept of using an Infrared Scanner to determine near freezing surface temperatures is feasible. The major problem identified was concerned with Infrared reflections which can result in significant errors if not controlled. Action taken to manage these errors will likely result in design and operational constraints to control the viewing angle and surface emissivity. The contents of this report are intended to aid and guide future implementation of this concept.

TM-78265 January 1980
Characterization of Epoxy Resin Binder
for SRB Sprayable Ablator MSA-1.
Donald E. Morris. Materials and Processes Laboratory. X80-10047

Techniques have been developed for the characterization and quality control of the epoxy resin binder used in the formulation of Marshall sprayable ablator (MSA-1) thermal

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protection system for the Space Shuttle Solid Rocket Booster. Four techniques, liquid chromatography, gel permeation chromatography, infrared spectroscopy and epoxy equivalent weight determinations, have been utilized to assess the chemical composition of the resin. Viscosity and lap shear tensile bond strength measurements were used to evaluate the physical properties.

TM-78266 February 1980
Evaluation of SRM Flex Bearing Materials and Processes. Thomas E. Wood.
N80-19264

Tensile, peel, and shear testing was performed on combinations of primers, adhesives, tycements and rubber compounds cured at various times and temperatures. In addition to the materials currently used in the fabrication of the SRM flex bearing, other systems were evaluated. A compatibility study between adhesives and tycements was initiated. The flex bearing mold design was reviewed by our tooling experts.

TM-78267 March 1980
Skylab Reactivation Mission Report. William B. Chubb, Editor. Systems Analysis and Integration Laboratory.
N80-21392

On July 11, 1979, Skylab impacted the Earth's surface. The debris dispersion area stretched from the South Eastern Indian Ocean across a sparsely populated section of Western Australia. This report discusses in some detail the events leading to the reentry of Skylab, together with a final assessment of the Skylab debris impact footprint. Also included are detailed evaluations of the various Skylab systems that were reactivated when control of Skylab was regained in mid-1978 after having been powered down since February 4, 1974.

TM-78268 February 1980
Isoelectric Focusing of Red Blood Cells in a Density Gradient Stabilized Column. Adam J. K. Smolka and Teresa Y. Miller. Space Sciences Laboratory.
N80-19217

This report summarizes various investigations into the steps commonly used to obviate gravity in isoelectric focusing. Isoelectric focusing is an equilibrium electrophoretic method in which amphoteric compounds are separated in a pH gradient according to their isoelectric values. Gravitational stabilization is required and is normally achieved by imposing a density gradient of neutrally charged carbohydrates on the pH gradient. Ficoll, a polysucrose, is commonly used in isoelectric focusing, and its influence on focused red blood cells was measured. The influence of the media pH at the cell application location was specifically determined in addition to other operational parameters, such as media properties and migration behavior of the cells.

TM-78269 February 1980
Improved Sample Management in the Cylindrical-Tube Microelectrophoresis Method. Adam J. K. Smolka. Space Sciences Laboratory.
N80-21466

A modification to an analytical microelectrophoresis system is described that improves the manipulation of the sample particles and fluid. The apparatus modification and improved operational procedure should yield more accurate measurements of particle mobilities and permit less skilled operators to use the apparatus.

TM-78270 March 1980
A Study of the Effect on a Typical Orbiter Payload Thermal Environment Resulting from Specular Reflections from the Forward Orbiter Radiators.

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R. Humphries, L. Turner, and J. W. Littles, Structures and Propulsion Laboratory. N80-21409

Most analyses performed to determine the Shuttle Payload Bay on-orbit thermal environment have considered all Orbiter, as well as payload, surfaces to be diffuse. The Orbiter radiator external coating is highly specular silverized teflon. This study considers solar energy specularly reflected from these radiators on a typical payload which, when deployed, extends above the payload bay envelope. Comparisons are made between the flux levels assuming both diffuse and specular radiators.

TM-78271 March 1980
Emergency Relief Venting of the Infrared Telescope Liquid Helium Dewar. Eugene W. Urban. Space Sciences Laboratory. N80-21724

An analysis is made of the emergency relief venting of the liquid helium dewar of the Spacelab 2 Infrared Telescope experiment in the event of a massive failure of the dewar guard vacuum. Such a failure, resulting from a major accident, could cause rapid heating and pressurization of the liquid helium in the dewar and lead to relief venting through the emergency relief system. This report estimates the heat input from an accident for various fluid conditions in the dewar and lead to relief venting through the emergency relief system. This report estimates the heat input from an accident for various fluid conditions in the dewar and considers the relief process as it takes place through one or both of the emergency relief paths. It is shown that under all reasonable circumstances the dewar will safely relieve itself, and the pressure will not exceed 85 percent of the proof pressure or 63 percent of the burst pressure.

TM-78272 March 1980
Characterization of Three Types of Silicon Solar Cells for SEPS Deep Space Missions. A. F. Whitaker, S. A. Little, and V. A. Wooden. Materials and Processes Laboratory. N80-24749

Three types of high performance silicon solar cells, textured P^+ 8 to 10 mil, planar P^+ 8 to 10 mil and planar P^+ 2 mil manufactured by Solarex Corporation have been evaluated for their low temperature and low intensity performance. Sixteen cells of each type were subjected to 11 temperatures and 9 intensities. The textured P^+ 8 to 10 mil cells provided the best performance both at 1 AU and at LTL1 conditions. The average efficiencies of this cell were 14.5% at 1 SC/ $+25^\circ\text{C}$ and 18.7% at 0.086 SC/ -100°C .

TM-78273 March 1980
High Time Resolution Observation of the Transient Event of 5 March 1970. M. C. Weisskopf, R. Elsner, W. Darbro, P. Ghosh, P. G. Sutherland, and J. Grindlay. Space Sciences Laboratory. N80-25268

On March 5, 1979, a very intense and unusual gamma-ray burst was observed with the KONUS experiment aboard the Venera 11 and 12 spacecraft. This document reports the detection of this event with an instrument on the HEAO-2 spacecraft and the measurement of the time of onset of the event to a statistical uncertainty of 220 μs .

TM-78274 January 1980
Chemical Vapor Deposition for Automatic Processing of Integrated Circuits. Bobby W. Kennedy. Electronics and Control Laboratory. N80-74690

This report presents a discussion of Chemical Vapor Deposition for automatic

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processing of integrated circuits including the wafer carrier and loading from a receiving air track into automatic furnaces and unloading on to a sending air track.

TM-78275* August 1980
Space Processing Application Rocket
Project SPAR V Final Report. Compiled
by F. Reeves and D. Schaefer.
N80-28404

The Space Processing Application Rocket Project (SPAR) V Final Report contains the compilation of the postflight reports of each of the principal investigators of the four selected science payloads, in addition to the engineering report as documented by the Marshall Space Flight Center (MSFC). In addition to a discussion of the flight operations and analyses, the sections on each experiment describe the objectives, rationale, and associated ground-based research activities to varying degrees.

The SPAR Project is coordinated and managed by MSFC as part of the Materials Processing in Space (MPS) program of the Office of Space and Terrestrial Applications (OSTA) of NASA Headquarters.

This technical memorandum addresses the payload manifest flown in the fifth of a series of SPAR flights conducted at the White Sands Missile Range and includes the experiments entitled "Agglomeration in Immiscible Liquids," "Contained Polycrystalline Solidification in Low G," "The Direct Observation of Dendrite Remelting and Macrosegregation in Casting," and "Uniform Dispersion by Crystallization."

TM-78276 May 1980
Evaluation of the Stress Corrosion
Cracking Resistance of Several High
Strength Low Alloy Steels. T. S. Hum-
phries and E. E. Nelson. Materials and
Processes Laboratory. N80-25413

A comprehensive investigation of the stress corrosion cracking resistance of high strength alloy steels 4130, 4340, and H-11 at selected strength levels and D6AC and HY140 at a single strength is presented. Round tensile and C-ring type specimens were stressed up to 100 percent of their yield strengths and exposed to alternate immersion in salt water, salt spray, the atmosphere at Marshall Space Flight Center, and the seacoast at Kennedy Space Center. Under the test conditions, 4130 and 4340 steels heat treated to a tensile strength of 1240 MPa (180 ksi), H-11 and D6AC heat treated to a tensile strength of 1450 MPa (210 ksi), and HY140 (1020 MPa, 148 ksi) are resistant to stress corrosion cracking because failures were not encountered at stress levels up to 75 percent of their yield strengths. A maximum exposure period of one month for alternate immersion in salt water or salt spray and three months for seacoast is indicated for alloy steel to avoid false indications of stress corrosion cracking because of failure resulting from severe pitting.

TM-78277 May 1980
An Experimental Investigation of Con-
vection in a Fluid That Exhibits Phase
Change. D. E. Fitzjarrald. Space Sciences
Laboratory. N80-25613

Convection flows were systematically observed in a layer of fluid between two isothermal horizontal boundaries. The working fluid was a nematic liquid crystal, which exhibits a liquid-liquid phase change at which latent heat is released and the density changed. In addition to ordinary Rayleigh-Benard convection when either phase is present alone, there exist two distinct types of convective motions initiated by the unstable density difference. When a thin layer of heavy fluid is present near the top boundary, hexagons with downgoing centers exist with no imposed thermal gradient. When a thin layer of light fluid is brought on near the

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lower boundary, the hexagons have upshooting centers. In both cases, the motions are kept going once they are initiated by the instability due to release of latent heat. Relation of the results to applicable theories is discussed.

TM-78278 March 5, 1980
F-104 Low-Gravity Calibration Tests
For Materials Processing in Space Pre-
cursory Experiments. R. M. Poorman.
N80-25355

The Materials Processing in Space Projects Office at Marshall Space Flight Center sponsored a precursory low-gravity flight experiment in an F-104 aircraft operated by Dryden Flight Research Center to check out the vehicle as a suitable flight test carrier for microgravity experiments. Calibration experiment verification tests in the F-104 were completed. Three flight parabolas were flown. A "quick look" at the test data shows all the test parameters recorded by telemetry had reasonable values. Photographic records are clear and distinct. Solidification modes were the same as those observed in other low-gravity environments. The F-104 has now been proven to be a useful test bed for low-gravity experiments which require less than 60 seconds of low-g time.

TM-78279 May 1980
Users Guide for Skylab Dynamics Program,, SKYDYN. M. S. Hopkins. Systems Dynamics Laboratory.
N80-26056

The Skylab Dynamics Program (SKYDYN) is an extensively modified version of the 6-degree-of-freedom digital program REENTER, developed by Northrop Services, Inc., Huntsville, AL. The program REENTR was modified for the Honeywell CP-V System and was tailored to the specific requirements for Skylab.

This user's manual provides a description of the capabilities of SKYDYN, the required input data and the resulting program output.

TM-78280 June 1980
A Preliminary Look at AVE-SESAME II
Conducted on 19-20 April 1979. Steven
F. Williams, Nicholas Horvath, and
Robert E. Turner. Space Sciences
Laboratory. N80-27916

This report contains information on data collected, synoptic conditions, and severe and unusual weather reported during the AVE-SESAME II period. The information presented is preliminary. The purpose of the report is to provide to researchers a preliminary look at conditions during the AVE-SESAME II period.

TM-78281 June 1980
AVE-SESAME II: 25-MB Sounding
Data. Steven F. Williams, Myron L.
Gerhard, and Robert E. Turner. Space
Sciences Laboratory. N80-26995

This report describes the rawinsonde sounding program for the AVE-SESAME II experiment and presents tabulated data at 25-mb intervals from the surface to 25 mb for the 23 National Weather Service and 19 special stations participating in the experiment. Soundings were taken at 3-hr intervals beginning at 1200 GMT on April 19, 1979, and ending at 1200 GMT on April 20, 1979 (nine sounding times). The method of processing is discussed briefly, estimates of the rms errors in the data presented, an example of contact data given, reasons for the termination of soundings below 100 mb, and soundings listed which exhibit abnormal characteristics.

TM-78282 June 1980
A Preliminary Look at AVE-SESAME III
Conducted on 25-26 April, 1979. Steven

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F. Williams, Nicholas Horvath, and Robert E. Turner. Space Sciences Laboratory. N80-28991

This report contains information on data collected, synoptic conditions, and severe and unusual weather reported during the AVE-SESAME III period. The information presented is preliminary. The purpose of the report is to provide to researchers a preliminary look at conditions during the AVE-SESAME III period.

TM-78283 June 1980
AVE-SESAME III: 25-MB Sounding Data. Steven F. Williams, Myron L. Gerhard, Luke P. Gilchrist, and Robert E. Turner. Space Sciences Laboratory. N80-26997

This report describes the rawinsonde sounding program for the AVE-SESAME III experiment and presents tabulated data at 25-mb intervals from the surface to 25 mb for the 23 National Weather Service and 19 special stations participating in the experiment. Soundings were taken at 3-hr intervals beginning at 1200 GMT on April 25, 1979, and ending at 1200 GMT on April 26, 1979 (nine sounding times). The method of processing is discussed briefly, estimates of the rms errors in the data presented, an example of contact data given, reasons given for the termination of soundings below 100 mb, and soundings listed which exhibit abnormal characteristics.

TM-78284 July 1980
Payload Crew Training Scheduler (PACTS) User's Manual. David L. Shipman.

This document is a user's manual for the operation of the Payload Specialist Training Scheduler (PACTS) which is used to schedule Payload Specialists for mission training on the Spacelab Experiments. PACTS is a fully

automated, interactive, computerized scheduling program equipped with tutorial displays. The tutorial displays are sufficiently detailed for use by a program analyst having no computer experience. PACTS is designed to operate on the UNIVAC 1108 computer system, and has the capability to load output into a PDP 11/45 Interactive Graphics Display System for printing schedules. The program has the capacity to handle up to three overlapping Spacelab missions.

TM-78285 May 1980
Advanced X-Ray Astrophysics Facility Science Working Group Report. N80-29219

The Advanced X-Ray Astrophysics Facility (AXAF) Science Working Group report documents the results of the studies by a group of 16 scientists appointed by the NASA Office of Space Sciences to examine the AXAF mission concept from a scientific viewpoint. This report contains (1) a brief description of the development of X-ray astronomy and a summary description of AXAF, (2) the scientific objectives of the facility, (3) a description of representative scientific instruments, (4) requirements for X-ray ground testing, and (5) a summary of studies related to spacecraft and support subsystems.

TM-78286** May 1980
ASHMET - A Computer Code for Estimating Insolation Incident on Tilted Surfaces. Robert F. Elkin and Ronald G. Toelle. Systems Analysis and Integration Laboratory. N80-27807

A computer code, ASHMET, has been developed by MSFC to estimate the amount of solar insolation incident on the surfaces of solar collectors. Both tracking and fixed-position collectors have been included. Climatological data for 248 U. S. locations are built into the code. This report describes the methodology of the code, and its input and output.

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The basic methodology used by ASH-MET is the ASHRAE clear-day insolation relationships modified by a clearness index derived from SOLMET-measured solar radiation data to a horizontal surface.

TM-78287 May 1980
ET LOX Modal Survey Analysis and
Test Assessment. R. L. McComas, Sys-
tems Dynamics Laboratory. N80-29414

This report presents the results of the analysis and modal test of the liquid oxygen tank and intertank of the Space Shuttle External Tank.

A description of analytical models, test article, and support hardware is presented. Frequency and damping are compared on a mode-by-mode basis.

The data assessment clearly confirms the validity of the analytical model and establishes a high level of confidence that the methodology will accurately predict modal characteristics of flight configurations.

TM-78288 June 1980
Shuttle Time and Frequency Transfer
Experiment. D. W. Allan, C. O. Alley,
R. Decher, R. F. C. Vessot, and G. M.
R. Winkler. Space Sciences Laboratory.

The report describes a proposed Space Shuttle experiment to demonstrate techniques for global high-precision comparison of clocks and primary frequency standards. The experiment, using transmitted microwave and pulsed laser signals, will compare a hydrogen maser clock onboard the Space Shuttle with a clock in a ground station. The goal of the proposed experiment is to demonstrate time transfer with accuracies of 1 nsec or better and frequency comparison at the 10^{-14} accuracy level.

TM-78289 May 1980
Stability Analysis of Multirate Sampled

Systems Using Matrix Frequency Response Techniques. Neal Hendrix. Systems Dynamics Laboratory.

The "Matrix Frequency Response" technique has been used to analyze stability of continuous and sampled data systems by the Vehicle Control Systems Branch, Control Systems Division, Systems Dynamics Laboratory for several years. Incorporation of "Frequency Decomposition" methods into the Matrix Frequency Response program creates an analysis tool which can be used to evaluate stability of 2:1 integer related multirate sampled data systems. The resulting Multirate Matrix Frequency Response program is used in conjunction with a Generalized Determinant Expansion Routine and a program which converts Laplace transformed S-plane transfer functions into the sampled data W-plane to yield a generalized analysis tool for the stability evaluation of 2:1 multirate sampled data control systems. This report deals with multirate stability analysis using the Multirate Matrix Frequency Response method and discusses extension of the method to permit analysis of other integer related multirate sampled systems.

TM-78290 June 13, 1980
Scheduler Software for Tracking and
Data Relay Satellite System Loading
Analysis - User Manual and Program-
mer Guide. Ray Craft, Christel Dunn,
Janet McCord, and Louis Simeone.
Data Systems Laboratory.

A user guide and programmer documentation are provided for a system of PRIME 400 mini-computer programs. The system was designed to support loading analyses on the Tracking Data Relay Satellite System (TDRSS); however, possible broader applications were considered throughout the software design. In essence, the system is a scheduler for various types of data relays (including tape recorder dumps and real-time relays) for orbiting payloads to the TDRSS.

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Several model options are available to statistically generate data relay requirements. TDRSS time lines (representing resources available for scheduling) and payload/TDRSS acquisition and loss of sight time lines are input to the scheduler from disk. Tabulated output from the interactive system includes a summary of the scheduler input and output information. A history file, which records every event generated by the scheduler, is written to disk to allow further scheduling on remaining resources and to provide data for graphic displays or additional statistical analysis.

TM-78291** **July 1980**
Solar Site Test Module. Ralph R. Kissel and Donald R. Scott. Electronic and Control Laboratory.

A solar site test module using the Rockwell AIM 65 micro-computer is described. The module is designed to work at any site where an IBM site data acquisition system (SDAS) is installed and is intended primarily as a troubleshooting tool. It collects sensor information (temperatures, flow rates, etc.) and displays or prints it immediately in calibrated engineering units. It will read one sensor on demand, periodically read up to 10 sensors or periodically read all sensors. Performance calculations can also be included with sensor data. Unattended operation is possible to, e.g., monitor a group of sensors once per hour. Work is underway to add a data acquisition system to the test module so that it can be used at sites which have no SDAS.

TM-78292 **August 1980**
Longitudinal and Transverse Magnetic Field Program Procedure and Detailed Specification (For Sigma 5). Caroline K. Wang. Space Sciences Laboratory.

This document presents a computer program and procedure for plotting the

contour of the data transferred from the Marshall Space Flight Center solar magnetograph. The plotted data then can be easily compared with solar data from other sources, such as the Solar Maximum Mission (SMM).

TM-78293** **July 1980**
Three Computer Codes to Read, Plot, and Tabulate Operational Test-Site Recorded Solar Data. Stephen D. Stewart, Robert J. Sampson, Jr., Richard E. Stonemetz, and Sandra L. Rouse. Systems Analysis and Integration Laboratory.

A computer program, TAPFIL, has been developed by MSFC to read data from an IBM 360 tape for use on the PDP 11/70. The information (insolation, flowrates, temperatures, etc.) from 48 operational solar heating and cooling test sites is stored on the tapes. Two other programs, CHPLOT and WRTCNL, have been developed to plot and tabulate the data. These data will be used in the evaluation of collector efficiency and solar system performance.

This report describes the methodology of the programs, their inputs, and their outputs.

TM-78294 **August 1980**
Materials Processing in Space Catalog of Tasks, FY-80. Edited by R. J. Naumann. Space Sciences Laboratory.

This report is a compilation of the active research tasks as of the end of fiscal year 1980 of the Materials Processing in Space Program, NASA Office of Space and Terrestrial Applications, involving several NASA Centers and other organizations. The purpose of this document is to provide an overview of the program scope for managers and scientists in industry, university, and government communities. The report is structured to include an introductory description of the

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program, its history, strategy and overall goal; identification of the organizational structures and people involved; and a description of each research task together with a list of recent publications.

The tasks are grouped into six categories: Crystal Growth; Metals, Alloys, and Composites; Glasses, Ceramics, and Refractories; Fluids, Transport, and Chemical Processes; Containerless and Ultrahigh Vacuum Processes; and Bioprocessing. In many cases a task is placed in more than one category. For example, studies involving fluid dynamics of crystal growth were entered in both Crystal Growth and Fluids, Transport, and Chemical Processes. This insures complete coverage of each category.

TM-78295 August 1980
Torques on a Nearly Rigid Body in a Relativistic Gravitational Field. Alessandro Caporali. Space Sciences Laboratory.

The effect of post-Newtonian potentials on the rotation of a nearly rigid body is shown to consist of a precession and a torque. The frequency of the precession can be exactly represented by means of suitable differential operators. The relativistic torques in the quadrupole approximation depend on the instantaneous orientation of the principal axes of one body with respect to the position — like the classical torque — and velocity of the other. For a relatively low-mass body, such as a gyroscope, these velocity-dependent torques have no observable consequences.

TM-78297 August 1980
Materials Processing in Space — 1980 Science Planning Document. Robert J. Naumann. Space Sciences Laboratory.

This report contains a detailed description of the scientific aspects of the Materials Processing in Space (MPS) program. Included

are: general summaries of the possible contributions that materials science experiments in space can make to the various disciplines, rationales of why it is necessary to perform certain experiments or processes in space, a general synopsis of what has been learned from previous experiments relating to space processing, summaries of current investigations, identification of remaining issues that require resolution, and recommendations for future direction of the program.

The purposes of the report are: (1) to acquaint the reader with the overall scope of the MPS program, (2) to present the status of scientific research in the program, (3) to identify areas that may be overemphasized or underemphasized, (4) to identify critical scientific open issues in the program, and (5) to provide a basis for formulating a coherent, focused research plan.

The report is divided into six major categories: Crystal Growth; Solidification of Metals, Alloys, and Composites; Fluids and Chemical Processes; Containerless Processing, Glasses, and Refractories; Ultrahigh Vacuum Processes; and Bioprocessing. For the reader's convenience, a detailed index is provided at the beginning of each section.

TM-78298 July 1980
Mated Vertical Ground Vibration Test. Edward W. Ivey. Systems Dynamics Laboratory.

This report presents the Mated Vertical Ground Vibration Test (MVGVT) program evolution, the test configurations, their suspension system and the test results compared with predicted analytical results. The MVGVT test began May 30, 1978 at Marshall Space Flight Center in Huntsville, Alabama with the Boost Configuration and ended February 28, 1979 with the launch end burn configuration.

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TM-78299

September 1980

The Influence of Wall Resonances on the Levitation of Objects in a Single-Axis Acoustic Processing Chamber. Bruce B. Ross. Space Sciences Laboratory.

Instabilities have apparently been observed in high-temperature, single-axis acoustic processing chambers. It is hypothesized that at certain temperatures strong wall resonances are generated within the processing chamber itself and that these transverse resonances are sufficient to disrupt the levitation "well." This investigation indicates that, if these wall resonances do exist in the processing chamber, they are apparently not strong enough to cause instabilities in the levitation well.

TM-78306

August 1980

Space Environmental Effects on Materials. R. J. Schwinghamer. Materials and Processes Laboratory.

The Space Shuttle will provide a low cost delivery system for Earth orbital payloads by amortizing launch costs through system reusability. This development paves the way for large platforms and structures in space. But successful design of long life platforms and structures for space use requires due consideration of space environmental effects on the materials used. Large space system materials, especially those in geosynchronous Earth orbit (GEO), will be subjected to vacuum, ultraviolet radiation and charged particle radiation which will influence the performance and functional lifetime of the systems. This report describes research oriented toward the acquisition of long term environmental effects data needed to support the design and development of large low Earth orbit (LEO) and GEO space platforms and systems for the next decade.

*Blue cover reports printed at Langley.

**DOE/NASA reports.

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TP-1548

October 1979

The Wave Structures of the Eady Model of Baroclinic Instability. Jae Min Hyun and William W. Fowlis, Space Sciences Laboratory. N79-32796

A comprehensive analysis is presented of the wave structures of the Eady model of baroclinic instability. By solving the linear quasi-geostrophic set of equations pertinent to the Eady model, the complex eigenvalues and the eigenfunctions are obtained. The propagation speed and the growth rate are computed. Detailed quantitative information is provided about the wave structures for several unstable modes, a marginally stable mode, and a stable mode. The peculiarities concerning the amplitude and the phase variations of the waves are noted as the wave-number varies from the unstable region to the stable region. Physical interpretations of the interrelationships among the dynamical variables are given, with a view toward revealing important aspects of the energy transfer from the basic state to the growing waves.

TP-1586

January 1980

Baroclinic Instability with Variable Gravity - A Perturbation Analysis. Albert C. Giere, William W. Fowlis, and Salvador Arias, Space Sciences Laboratory. N80-15445

Solutions are obtained for a quasi-geostrophic baroclinic stability problem in which gravity is a function of height. Curvature and horizontal shear of the basic state flow are omitted and the vertical and horizontal temperature gradients of the basic state are taken as constant. The primary motivation of this work was to determine the effect of a variable dielectric body force, analogous to gravity, on baroclinic instability for the design of a spherical, baroclinic model for Spacelab. Such modeling cannot be performed in a laboratory on the Earth's surface because the body force cannot be made

strong enough to dominate terrestrial gravity. A consequence of the body force variation and the preceding assumptions is that the potential vorticity gradient of the basic state vanishes. The problem is solved using a perturbation method. The solution gives results which are qualitatively similar to Eady's results for constant gravity; a short wavelength cutoff and a wavelength of maximum growth rate are observed. Based on averaged values of the basic state, both the wavelength range of the instability and the growth rate at maximum instability are increased. The conclusion is that the presence of the variable body force will not significantly alter the dynamics of the Spacelab experiment. The solutions are also relevant to other geophysical fluid flows where gravity is constant but the static stability or Brunt-Vaisala frequency is a function of height.

TP-1651

May 1980

Ice Crystal Growth in a Dynamic Thermal Diffusion Chamber. Vernon W. Keller, Space Sciences Laboratory. N80-23934

Ice crystals were grown in a supersaturated environment produced by a dynamic thermal diffusion chamber, which employed two horizontal plates separated by a distance of 2.5 cm. Air was circulated between and along the 1.2 m length of the plates past ice crystals which nucleated and grew from a fiber suspended vertically between the two plates. Using a zoom stereo microscope with a magnification which ranged from 3X to 80X and utilizing both 35 mm still photographs and 16 mm time lapse cine films taken through the microscope, the variation of the shape and linear growth rate of ice crystals was examined as a function of the ambient temperature, the ambient supersaturation and the forced ventilation velocity. The ambient growth conditions were varied over the range of temperature 0°C to -40°C, over the range of supersaturation 4% to 50% with respect to

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ice, i.e., over vapor density excesses ranging from 0.07 g m^{-3} to 0.7 g m^{-3} , and over the range of forced ventilation velocities 0 cm s^{-1} to 20 cm s^{-1} .

It is shown that the introduction of a ventilation velocity is roughly equivalent to increasing the ambient supersaturation. For a fixed ambient temperature and ambient supersaturation, the linear 'a'-axis growth rate is directly proportional to the square root of the ventilation velocity, as theory predicts, provided the crystal shape does not change significantly. The transitions plate \rightarrow dendrite and column \rightarrow needle occur at a lower ambient supersaturation as the ventilation velocity increases. A definite time constant, which is a function of the ambient temperature, the ambient supersaturation and the magnitude of the change in the ventilation velocity, exists for the transition of both crystal shape and linear growth rate following a change in the ventilation velocity. For increasing ventilation velocities at a fixed ambient supersaturation the maximum in the linear growth rate near -15°C apparently occurs at successively colder temperatures. Over the temperature range -4°C to -6°C growth occurs along a direction up to 25° from the 'c'-axis as the local supersaturation is increased. Thus, under the proper temperature conditions a change in the local supersaturation can induce a change, not only in the absolute growth rates, but also in the relative growth rates along the 'a' and 'c'-axes.

In the presence of $10 \text{ }\mu\text{m}$ mean diameter droplets with concentrations of 10^3 to 10^5 cm^{-3} droplet accretion accounted for over 90% of the growth of both ice crystal columns and dendrites at ventilation velocities of 15 cm s^{-1} . However, even at higher velocities the most extensively rimed crystals still retained the original orientation of their crystalline axes. At velocities less than 1.0 cm s^{-1} droplets of $10 \text{ }\mu\text{m}$ diameter or smaller

evaporated as they approached a growing ice crystal and crystal growth was entirely by vapor diffusion.

The first vapor grown discoid ice crystals were observed. They grew in the temperature regime -5°C to -7°C at low local supersaturations, i.e., in the regime formerly believed to only support nearly equiaxed columns.

Results from these experiments are interpreted in terms of diffusion through a local boundary layer whose thickness is a function of ventilation velocity, the diffusivity of water vapor and heat through air, and the crystal shape; and interaction with different nucleation and growth kinetics on different surfaces. Two-dimensional nucleation and layer growth from corners or edges is believed to occur at ambient supersaturations significantly lower than present theories would predict. At low supersaturation and temperature the crystal habit and growth may be controlled by the presence of defects sometimes giving rise to crystals of habit opposite to that normally observed.

TP-1702

July 1980

Release Mechanism for Releasing and Reattaching Experiments on the Space Shuttle. A. V. Clark. Structures and Propulsion Laboratory. N80-27694

The Release Mechanism (REM) unatches an experiment so that it can be moved about inside and outside the Shuttle bay by the remote manipulator system (RMS) then reattaches it to the REM base. With the REM being operated from the crew compartment after the RMS has been attached to the experiment, the REM releases the experiment by an electric motor driving a gear train and linkage which extracts four pins from holes in four plates. Electrical connectors on the REM are disengaged by the mechanical action of the structural pins retracting from the plates.

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When the REM releases the experiment, an unlatched indicator is actuated in the crew compartment, and then the experiment can be moved by using the RMS.

To reattach the experiment to the REM, the RMS places the experiment with REM attachment angles against the flat, smooth surface of the REM; then the RMS moves the experiment into position for latchup. Locating the experiment for reattachment might be analogous to finding the corner of a room in the dark when you are standing on the floor and walk to a wall, then follow the wall to a corner at (another wall).

When the REM is in the "corner" ready to be latched, indications in the crew compartment show the experiment position relative to the REM. Actuation of an electric

motor drives the four pins into the four holes in the plates. When fully latched, a switch actuated by the motion of the linkage, shuts the electric motor off and gives an indication to the crew compartment that the REM is latched.

TP-1719

August 1980

Energy Saving Concepts Relating to Induction Generators. Frank Nola. Electronics and Control Laboratory.

Two technologies relating to energy saving concepts for induction generators are presented in this paper. The first describes a regenerative scheme using an induction generator as a variable load for prime movers under test. The second describes a method for reducing losses in induction machines used specifically as wind driven generators.

NASA REFERENCE PUBLICATIONS

RP-1034

September 1979

Convective Rainfall Estimation from Digital GOES-1 Infrared Data. Gary L. Sickler and Aylmer H. Thompson. This report is based on a study accomplished as a Master of Science Thesis at Texas A&M University. N79-31835

RP-1054

January 1980

Thunderstorm-Environment Interactions Determined with Three-Dimensional Trajectories. Gregory Sims Wilson, Space Sciences Laboratory. N80-16675

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CP-2104 April 3-5, 1979

Proceedings: Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems. Edited by Dennis W. Camp and Walter Frost. Marshall Space Flight Center. N80-14633

CP-2105 September 1979

Summary of the NASA/MSFC FY-79 Severe Storms and Local Weather Research Review. Marshall Space Flight Center. N79-33722

CP-2111 August 8-11, 1979

Scientific Research with the Space Telescope, International Astronomical Union Colloquium Number 54. Marshall Space Flight Center. N80-22130

CP-2113 November 1979

HEAO Science Symposium. Marshall Space Flight Center. N80-14977

CP-2139 June 1980

Proceedings of the Fourth Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems. Marshall Space Flight Center.

CP-2140 April 1, 1980

Exploratory Meeting on Airborne Doppler LIDAR Wind Velocity Measurements. Marshall Space Flight Center. N80-26999

CP-2145 June 3-5, 1980

NASA/MSFC FY-80 Atmospheric Processes Research Review. Marshall Space Flight Center. N80-28965

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- CR-3136** January 1980
Analysis of the Measured Effects of the Principal Exhaust Effluents from Solid Rocket Motors. R. Dawbarn, M. Kinslow, and D. J. Watson. H-19386B. Arnold Engineering Development Center. N80-15660
- CR-3207** December 1979
Jet Transport Performance in Thunderstorm Wind Shear Conditions. John McCarthy, Edward F. Blick, and Randall R. Bensch. NAS8-31377. The University of Oklahoma. N80-13742
- CR-3213** January 1980
1979 Current Research on Aviation Weather (Bibliography). Barry S. Turkel and Walter Frost. NAS8-32692. The University of Tennessee Space Institute. N80-14651
- CR-3255** March 1980
Fog Dispersion. Larry S. Christensen and Walter Frost. NAS8-33095. FWG Associates, Inc. N80-19703
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The NASA/MSFC Global Reference Atmospheric Model - MOD 3 (With Spherical Harmonic Wind Model). C. G. Justus, G. R. Fletcher, F. E. Gramling, and W. B. Pace. NAS8-32897. Georgia Institute of Technology. N80-19704
- CR-3284** May 1980
Wake Characteristics of Buildings in Disturbed Boundary Layers. Earl Logan, Jr., and Jingfa Chang. NAS8-32357. College of Engineering and Applied Sciences, Arizona State University. N80-24940
- CR-3285** May 1980
EVA Manipulation and Assembly of Space Structure Columns. Tomas E. Loughhead and Edwin C. Pruett, Essex Corporation. NAS8-32989. N80-23988
- CR-3308** August 1980
A Preliminary Assessment of the Accuracy of Selected Meteorological Parameters Determined from Nimbus 6 Satellite Profile Data. James R. Scoggins and Gary Petti. NAS8-31773. Texas A&M University. N80-29964
- CR-3309** September 1980
Atmospheric Turbulence Simulation Techniques With Application to Flight Analysis. Show-Tien Wang and Walter Frost. NAS8-32692. The University of Tennessee Space Institute.
- CR-3317** September 1980
Satellite Power Systems (SPS) Concept Definition Study Volume I - Executive Summary. G. M. Hanley. NAS8-32475. Rockwell International.
- CR-3318** September 1980
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- CR-3319** March 1979
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- CR-3320** March 1979
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- CR-3321** September 1980
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CR-161309 September 30, 1979
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- CR-161311 September 15, 1979**
Orbit Transfer Vehicle Engine Study,
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Aerojet Liquid Rocket Company.
X80-70049

- CR-161312** **April 15, 1979**
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CLIFTON, K. S. ES64
HILL, C. K. ES64
Low-Light-Level Television Measurements of Lightning. For publication in the Bulletin of the American Meteorological Society.

COFIELD, KESTER I., JR. NA51
Spacelab Status Report. For presentation at the National Technical Association Meeting to be held in Chicago, Illinois on August 11-17, 1980.

COLLINS, RUFUS D., JR. EL51
The Cost of Inspection Error. For publication in the Journal of the National Estimating Society.

CRABTREE, W. L. EC12
Solar Thermophotovoltaic Space Power System. For presentation at the Inter-society Energy Conversion Engineering Conference to be held in Seattle, Washington on August 19-21, 1980.

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CRAFT, HARRY G., JR. JA12
A Review of Spacelab Mission Management Approach. For presentation at the DGLR/AAS Symposium - "Shuttle/Spacelab - The New Transportation System and Its Utilization" to be held in Hannover, West Germany on April 28-30, 1980.

CRAVEN, PAUL D. ES53
REASONER, DAVID L. ES53
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CROFT, F. MAX AC01
WHITE, DON
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CUMINGS, NESBITT P. ES52
McINTOSH, W. R. ES52
The MSFC Solar Correlation Tracker. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980.

DARBRO, W. ES62
ELSNER, R. ES62
GHOSH, P. ES62
WEISSKOPF, M. C. ES62
GRINDLAY, J. E.
Harvard-Smithsonian Center for Astrophysics
SUTHERLAND, P. G. McMaster University
Observations of SMC X-1 with the Monitor Proportional Counter on the Einstein (HEAO-2) Observatory. For presentation at the AAS High Energy Astrophysics Division Conference to be

held in Cambridge, Massachusetts on January 28-30, 1980 and for publication in the AAS Bulletin.

DARBRO, W. ES62
GHOSH, P. ES62
ELSNER, R. F. ES62
WEISSKOPF, M. C. ES62
SUTHERLAND, P. G. McMaster University
GRINDLAY, J. E.

Harvard-Smithsonian Center for Astrophysics
Observations of SMC X-1 with the Monitor Proportional Counter on the Einstein (HEAO-2) X-Ray Observatory: The Pulse Period and Its History. For publication in the Astrophysical Journal.

DECHER, RUDOLF ES61
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DECHER, R. ES61
A Space System for High-Precision, Global Time and Frequency Comparison of Clocks. For presentation at the Precise Time and Time Interval Applications and Planning Meeting to be held in Greenbelt, Maryland on December 2-4, 1980.

DENTON, STEPHEN J. PD22
ENGLER, ERICH E. EP13
Large Space Structures Activity at MSFC. For presentation at the AIAA/ASME 21st SDM Conference to be held in Seattle, Washington on May 12-14, 1980.

DeSANCTIS, CARMINE E. NA01
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DISHIER, JOHN H. NASA Headquarters
HETHCOAT, JERRY P. PS01
PAGE, MILTON A. PS01
Advanced Space Transportation Systems. For presentation at the DGLR/AAS Symposium to be held in Hannover, Germany on April 28-30, 1980.

DORAN, BILL EL03
SHAFFER, JOSEPH, JR.
Jet Propulsion Laboratory
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DOWNEY, JAMES A. PS01
DAILEY, CARROLL C. PS01
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ELMS, R. V., JR.
Lockheed Missiles and Space Co., Inc.
YOUNG, L. E. EC12
SEP Solar Array Development Testing. For publication in Direct Energy Conversion.

ELSNER, R. F.
MSFC-NAS/NRC Research Associate
GHOSH, P.
MSFC-NAS/NRC Research Associate
DARBRO, W. ES62
WEISSKOPF, M. C. ES62
SUTHERLAND, P. G.
Alfred P. Sloan Foundation Fellow
GRINDLAY, J.
Alfred P. Sloan Foundation Fellow
Observations of Cygnus X-3 with the Einstein (HEAO-2) X-Ray Observatory:

The Period Derivative and the Asymmetric X-Ray Light Curve. For presentation at the AAS High Energy Astrophysics Division Meeting to be held at Cambridge, Massachusetts on January 28-30, 1980 and for publication in the AAS Bulletin.

ELSNER, R. F. ES62
(NAS/NRC Resident Research Associate)
GHOSH, P. ES62
(NAS/NRC Resident Research Associate)
DARBRO, W. ES62
WEISSKOPF, M. C. ES62
SUTHERLAND, P. G.
Alfred P. Sloan Foundation Fellow
GRINDLAY, J. E.

Alfred P. Sloan Foundation Fellow
Observations of Cygnus X-3 with the Einstein (HEAO-2) X-Ray Observatory: The Period Derivative and the Asymmetric X-Ray Light Curve. For publication in the Astrophysical Journal.

ELSNER, R. F. ES62
NAS/NRC Resident Research Associate
GHOSH, P. ES62
NAS/NRC Resident Research Associate
LAMB, F. K. University of Illinois
On the Origin and Persistence of Long Period X-Ray Sources. For publication in the Astrophysical Journal Letters.

ENGLER, E. E. EP13
AGAN, W. E. Vought Corp.
Erectable/Deployable Concepts for Large Space Structures. For presentation at the 39th Annual Conference of the Society of Allied Weight Engineers, Inc., to be held in St. Louis, Missouri on May 12-14, 1980 and for presentation at the AIAA/ASME/ASCE/AHS 21st Structures, Structural Dynamics and Materials Conference to be held in Seattle, Washington on May 12-14, 1980.

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| ENGLER, E. E. | EP13 | FISHMAN, G. J. | ES62 |
| STOKES, JACK | EP13 | DUTHIE, J. G. | ES62 |
| AGAN, W. E. | Vought Corporation | | NAS/NRC Research Associate |
| Neutral Buoyancy Test Results of a Deployable Space Beam. For presentation at the AIAA 2nd Conference on Large Space Platforms to be held in San Diego, California in February 1981. | | DUFOUR, R. J. | Rice University |
| | | Optical Studies of the Regions of the Gamma-Ray Bursts of 19 Nov 1978 and 5 Mar 1979. For publication in Astrophysics & Space Science, 1980 (The Netherlands). | |
| FELIX, A. RICHARD | ED35 | FOUNTAIN, W. F. | ES62 |
| Calibration Results of a 0.25-Inch-Diameter Six-Component Force Balance For presentation at the 53rd Meeting of the Supersonic Tunnel Association to be held in Palo Alto, California on March 26-28, 1980. | | GARY, G. A. | ES62 |
| | | O'DELL, C. R. | DS30 |
| | | MUFSON, S. L. | Indiana University |
| | | HOWARD, W. E., III | National Science Foundation |
| FERNANDEZ, KENNETH | EF42 | WOLFF, M. T. | Indiana University |
| Application of a Computer Controlled Robot to Remote Equipment Maintenance. For presentation at the Industry Applications Society Conference (IAS-CON) to be held in Cincinnati, Ohio on September 29-October 3, 1980. | | An Investigation of the Neutral and Ionized Gas in M16. For publication in the Astrophysical Journal. | |
| FERNANDEZ, KENNETH | EF37 | FOWLIS, WILLIAM W. | ES82 |
| Computer Control of a Robotic Satellite Servicer. For presentation at the Southeastcon '80 to be held in Nashville, Tennessee on April 15, 1980. | | Results of the Research Program for the Design and Construction of a Spherical Baroclinic Experiment for Spacelab Flights. For presentation at the Third Conference on Atmospheric and Oceanic Waves and Stability Conference (American Meteorological Society) to be held in San Diego, California on January 19-22, 1981. | |
| FIELD, ELMER L. | TA31 | FOWLIS, WILLIAM | ES82 |
| Space Telescope Design for Maintenance. For presentation at the EASCON '80 IEEE to be held in Washington, D. C. on September 30, 1980. | | Book Review: Rotation Fluids in Geophysics. For publication in EOS Transactions. | |
| FIELDS, STANLEY A. | ES53 | FOWLIS, WILLIAM W. | ES82 |
| Cusp Region Particle Precipitation and Ion Convection for Northward Interplanetary Magnetic Field. For publication in Geophysical Research Letters. | | ANTAR, BASIL N. | University of Tennessee Space Institute |
| FISHMAN, G. J. | ES62 | Baroclinic Instability of a Real Hadley Cell. For presentation at the Third Conference on Atmospheric and Oceanic Waves and Stability (American Meteorological Society) to be held in San Diego, California on January 19-22, 1981. | |
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ANTAR, BASIL N.

University of Tennessee Space Institute
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publication in the Journal of Atmos-
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FOWLIS, WILLIAM W. ES82
GIERE, ALBERT C.

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GELLER, GERALD EP31

LAMB, CARL D. EP31

ROSS, WALT Rocketdyne
Space Shuttle -- Main Engine -- Hydrau-
lic Actuation System. For presentation
at the 15th Aerospace Mechanisms
Symposium to be held at MSFC, Hunts-
ville, Alabama on May 14-15, 1981.

GHOSH, P. ES62 (NRC)

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WEISSKOPF, M. C. ES62

SOUTHERLAND, P.

McMaster University (Sloan Fellow)
The asymmetric 4.8 Hour X-Ray Modu-
lation of Cygnus X-3: Model Light
Curves and Inferred Orbital Parameters.
For publication in the Astrophysical
Journal.

GHOSH, P.

MSFC-NAS/NRD Research Associate
ELSNER, R. F.

MSFC-NAS/NRC Research Associate
WEISSKOPF, M. C. ES62

SUTHERLAND, P. G.

Alfred P. Sloan Foundation Fellow
Einstein (HEAO-2) Observations of
Cygnus X-3: Model X-Ray Light Curves
and Binary Orbit Determination. For
presentation at the AAS High Energy
Astrophysics Division Meeting to be
held at Cambridge, Massachusetts on
January 28-30, 1980 and for publication
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GOULD, JOHN M. EC45

EDGE, TEDDY M. EC45

The Standard Transistor Array (STAR)
Design System, Part I, A Two-Layer
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presentation at the 17th Design Automa-
tion Conference to be held in Minneapo-
lis, Minnesota on June 23-25, 1980.

GRAVES, J. R. EC12

Advanced Development of a Program-
mable Power Processor. For presentation
at the Intersociety Energy Conversion
Engineering Conference to be held in
Seattle Washington on August 19-21,
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GREEN, JAMES L. ES61

Observations of AKR. For presentation
at the Chapman Conference on Forma-
tion of Auroral Arcs, AGU to be held in
Fairbanks, Alaska on July 21, 1980.

GREENWOOD, TERRY F. ED33

A Low Altitude Solid Rocket Motor
Viscous Plume, Impingement Flowfield
and Thermal Response Model and Its
Application to the Pressure and Thermal
Design Loads of Space Shuttle Launch
Complex 39. For presentation at the
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to be held in Colorado Springs, Colorado
on November 18-20, 1980.

GRINER, C. S. EH22
PARR, R. A. EH22
ROBERTSON, S. J. EH22
JOHNSTON, M. H. EH22

The Direct Observation of Uni-Directional Solidification as a Function of Gravity Level. For publication in the Journal of Crystal Growth.

GRINER, DONALD B. EC32
Visible Light Scatter Measurement of AXAF Mirror Samples. For presentation at the SPIE Huntsville Electro-Optical Technical Symposium to be held in Huntsville, Alabama on September 29-October 3, 1980.

GUTTMAN, C. H. PS01
LEVINGSTON, L. Johnson Space Center
Satellite Power System (SPS). For presentation at the Satellite Power Systems DOE/NASA Program Review and Symposium to be held in Lincoln, Nebraska on April 22-25, 1980.

HAGYARD, M. J. ES52
WEST, E. A. ES52
SMITH, J. E. ES52
Interpretations of Filter Magnetograph Results Including Solar Magneto-Optical Effects: Theory. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980.

HALL, GERALD E. JA51
Spacelab Payload Standard Modular Electronics (SPSME), NASA Standard Hardware. For presentation at the Instrument Society of America 26th International Symposium to be held in Seattle, Washington on May 5-8, 1980.

HAMAKER, JOSEPH PP03
Energy Economics in the Eighties. For presentation at the National Estimating Society Seminar "Cost Estimating; An Assessment of Current Technology and Methods" to be held in Huntsville, Alabama on June 3, 1980.

HARDY, GEORGE B. SA41
Space Shuttle Solid Rocket Booster. For presentation at the AAS Annual Conference to be held in Los Angeles, California on October 29-November 1, 1979.

HEAMAN, JOHN P. ED35
A Computer Controlled System for Acquisition and Interactive Analysis of Unsteady Aerodynamic Data. For presentation at the Integration of Computers and Wind Tunnel Testing Conference to be held in Chattanooga, Tennessee on September 24-25, 1980.

HOLLAND, LAWRENCE ROZIER ES72
A Thermal Transmission Function for Fused Silica Ampoules. For publication in the Journal of Crystal Growth (The Netherlands).

HOOPER, JAMES W. EF43
Algorithmic Formulations for Simulation Strategies. For publication in Simulation.

HORTON, WILLIAM P. EE11
Solid Rocket Booster. For presentation at the Seventeenth Space Congress to be held in Cocoa Beach, Florida on April 31, 1980.

HOWELL, J. T. PD12
HUNG, J. C. University of Tennessee
Command Signal Generation for Satellite Power System Pointing Control. For presentation at the Southeastern Symposium Theory to be held in Virginia Beach, Virginia on May 19-20, 1980.

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| HUNG, J. C. | University of Tennessee | |
| PEEBLES, P. Z. | University of Tennessee | |
| A Study of Satellite Power System Pointing Control. For presentation at the 1980 Satellite Power Systems DOE/NASA Program Review and Symposium to be held in Lincoln, Nebraska on April 22-25, 1980. | | |
| HSU, J. P. | ES63 | |
| A Finite Diagram-Theory for Yang-Mills Fields: I. Unitarity and Gauge Independence. For publication in II Nuovo Cimento (Italy). | | |
| HSU, J. P. | ES63 | |
| A Finite Diagram-Theory for Yang-Mills Fields: II. High Energy Amplitudes in the Sixth Order. For publication in II Nuovo Cimento (Italy). | | |
| HSU, J. P. | ES63 | |
| The Question of Universal Constants. For publication in Physical Review Letters. | | |
| HYUN, J. M. | NRC/NAS-ES82 | |
| Baroclinic Instability in Two Coupled Eady-Type Zonal Currents with Different Shear. For publication in the Journal of Atmospheric Sciences. | | |
| HYUN, J. M. | ES82 | |
| FOWLIS, W. W. | ES82 | |
| WARN-VARNAS, A. | NORDA | |
| Comparison of Numerical Results and Laser Measurements for Stratified Spin-Up Experiments. For presentation at the Third Conference on Atmospheric and Oceanic Waves and Stability (American Meteorological Society) to be held in San Diego, California on January 19-22, 1981. | | |
| IVORY, CORNELIUS F. | ES73 | |
| Continuous Flow Electrophoresis: The | | |
| Crescent Phenomena Revisited, Part I. Isothermal Effects. For publication in the Journal of Chromatography (The Netherlands). | | |
| JOHNSTON, MARY H. | EH22 | |
| OWEN, ROBERT B. | ES22 | |
| Laser Shadowgraph and Schlieren Studies of Gravity Related Flow During Solidification. For publication in Review of Scientific Instruments. | | |
| JOHNSTON, MARY HELEN | EH22 | |
| OWEN, ROBERT B. | ES74 | |
| Study of Optical Techniques for the Observation of Gravity Related Flow During Solidification. For presentation at the 157th Meeting of the Electrochemical Society to be held in St. Louis, Missouri on May 11-16, 1980. | | |
| JONES, K. W. | EL42 | |
| SPEAK, C. A. | TC/Wasatch | |
| Space Shuttle Solid Rocket Motor Improved Performance Design. For presentation at the JANNAF Conference to be held in New Orleans, Louisiana on May 26-28, 1981. | | |
| JONES, LEE W. | EP24 | |
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| KAUFMAN, JOHN W. | ES82 | |
| FROST, WALTER | FWG Associates, Inc. | |
| Wind-Wheel Turbine. For presentation at the SERI Second Wind Energy Innovative Systems Conference to be held in Colorado Springs, Colorado on December 3-5, 1980. | | |
| KELLER, VERNON W. | ES83 | |
| HALLETT, JOHN | Desert Research Institute | |
| The Plate-Dendrite Transition of | | |

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Growing Snow Crystals. For presentation at the VIIIth International Conference on Cloud Physics to be held in Clermont, France on July 15-19, 1980.

KELLER, V. ES83
McKNIGHT, C. V. Texas Instruments, Inc.
HALLETT, J. Desert Research Institute
Growth of Ice Disks from the Vapor and the Mechanism of Habit Change of Ice Crystals. For publication in the Journal of Crystal Growth.

KELLER, VERNON W. ES83
SAC, ROBERT I. Joseph Oat Corporation
Microphysical Development of a Pulsating Cumulus Tower: A Case Study. For publication in the Quarterly Journal of the Royal Meteorological Society (London).

KELLER, VERNON W. ES83
SAX, ROBERT I. ES83
Observational Evidence for Secondary Ice Generation in a Deep Convection Cloud. For presentation at the VIIIth International Conference on Cloud Physics to be held in Clermont, France on July 15-19, 1980.

KELLER, VERNON W. ES83
VAUGHAN, O. H., JR. ES83
Ice Crystal Growth from Liquid in Low-Gravity. For presentation at the VIIIth International Conference on Cloud Physics to be held in Clermont, France on July 15-19, 1980.

KIEFLING, LARRY A. ED22
Space Shuttle Main Engine, Nozzle-Steerhorn Dynamics. For presentation at the AIAA/ASME/ASCE/AHS 22nd Structure, Structural Dynamics and Materials Conference to be held in Atlanta, Georgia on April 6-8, 1981.

KRALL, K. R. et al. ES52 (NAS Fellow)
Analysis of Changes in Photospheric Magnetic Fields Within a Flare-Productive Active Region. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980.

KRALL, K. R. ES51 (NRC Associate)
ANTIOCHOS, S. K. Stanford University
The Evolution of Active Region Loop Plasma. For publication in the Astrophysical Journal.

KROES, ROGER L. ES74
Growth of TGS Crystals by Solution Technique Onboard Spacelab III. For presentation at the Electrochemical Society Meeting to be held in St. Louis, Missouri on May 11-16, 1980.

KROES, ROGER L. ES74
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LACY, L. L. ES74
JOHNSON, J. ES74
STEINBERG, J. Drexel University
LORD, A. E. JR. Drexel University
Production of Bulk Amorphous $\text{Pd}_{77.5}\text{Si}_{16.5}\text{Cu}_6$ in a Containerless Low-Gravity Environment. For publication in Applied Physics Letters.

LACY, L. L. ES74
ROBINSON, M. B. ES74
RATHZ, T. J. ES74
Containerless Supercooling and Solidification in Drop Tubes. For publication in the Journal of Crystal Growth.

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(Available only from authors. Dates are presentation dates.)

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| LANIER, J. R., JR. | EC12 | |
| KAPUSTKA, ROBERT E. | EC12 | |
| GRAVES, J. | EC12 | |
| LUKENS, F. E. | | Martin Marietta Aerospace |
| Advanced Development of a Programmable Power Processor. For presentation at the International Energy Conversion and Electronics Conference to be held in Seattle, Washington on August 18-22, 1980. | | |
| LINDSTROM, ROBERT E. | SA01 | |
| Status of Space Shuttle ET, SRB and SSME. For presentation at the SAE Aerospace Congress to be held in Los Angeles, California on October 14, 1980. | | |
| LINTON, ROGER C. | ES64 | |
| FOUNTAIN, JAMES F. | ES64 | |
| McKEOWN, D. | | Faraday Laboratories, Inc. |
| FOUKAL, P. | | Atmospheric and Environmental Research, Inc. |
| NOYES, ROBERT W. | | Smithsonian Astrophysical Observatory |
| The Crystal Cavity Radiometer and Solar Radiant Flux Variations. For presentation at the Spring Meeting of the American Geophysical Union to be held in Toronto, Canada on May 22-27, 1980. | | |
| LOMBARDO, J. | EP21 | |
| GOETZ, O. K. | EP21 | |
| RODGERS, R. N. | EP21 | |
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| LOOSE, J. D. | EL52 | |
| FLEISCHMAN, G. L. | | General Electric |
| SCOLLOW, T. R. | | General Electric |
| Vapor Chambers for Atmospheric Cloud Physics Laboratory. For presentation at | | |
| the AIAA 15th Thermophysics Conference to be held in Snowmass, Colorado on July 14-16, 1980. | | |
| LOW, B. C. | ES51 | |
| Eruptive Solar Magnetic Fields. For publication in the Astrophysical Journal. | | |
| LOW, B. C. | ES51 (NAS Fellow) | |
| Exact Magnetostatic Models of Filament Prominences. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980. | | |
| LOW, B. C. | ES52 | |
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| LOW, B. C. | ES51 | |
| NAS/NRC Research Associate On Determining the Magnetic Energy in the Solar Active Region. For publication in the Astrophysical Journal Letters. | | |
| LOW, B. C. | ES51 | |
| The Vertical Filamentary Structures of Quiescent Prominences. For publication in Solar Physics (Holland). | | |
| LOW, B. C. | ES51 | |
| LERCHE, I. | | University of Chicago |
| Ohmic Resistivity and the Structure of Hydromagnetic Transverse Shocks. For publication in Journal of Plasma Physics. | | |
| LOW, B. C. | ES51 | |
| WU, S. T. | | University of Alabama in Huntsville |
| Thermal Balance and Magnetostatic Equilibrium in a Prominence Sheet. I. A Class of Analytic Solutions. For publication in the Astrophysical Journal. | | |

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| LUNDQUIST, C. A. | ES01 | Value Problems by the Method of |
| FICHTL, G. H. | ES82 | Nearcharacteristics. For publication in |
| NAUMANN, R. J. | ES71 | The Astrophysical Journal. |
| Fluid Mechanics and Solidification Investigation in Low-Gravity Environments. For presentation at the 31st International Astronautical Federation (IAF) Congress to be held in Tokyo, Japan on September 21-28, 1980. | | |
| McGUIRE, JANICE K. | ES73 | |
| MILLER, TERESA Y. | ES73 | |
| TIPPS, RUBY W. | ES73 | |
| SNYDER, ROBERT S. | ES73 | |
| RIGHETTI, PIER GIORGIO | | |
| University of Milano (Italy) | | |
| New Experimental Approaches to Isoelectric Fractionation of Cells. For publication in Cell Biophysics. | | |
| McPHERSON, W. B. | EH23 | |
| 304 Stainless Steel for Liquid and Gaseous Hydrogen Pipelines. For presentation at the 3rd International Conference - Effect of Hydrogen on Behavior of Materials to be held in Moran, Wyoming on August 25-29, 1980. | | |
| MALLERNEE, MAX E. | AP12 | |
| Cost Estimating: A Current Perspective on Techniques and Methods. For presentation in Huntsville, Alabama on June 3, 1980 | | |
| MEEGAN, C. A. | ES62 | |
| FISHMAN, G. J. | ES62 | |
| HAYMES, R. C. | | Rice University |
| Search for Transient Gamma-Ray Lines. For presentation at the AAS 155th Meeting to be held at San Francisco, California on January 13-16, 1980 and for publication in the Bulletin of the AAS. | | |
| NAKAGAWA, Y. | ES51 | |
| Evolution of Solar Magnetic Fields: A New Approach to MHD Initial-Boundary | | |
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| NAKAGAWA, Y. | ES51 (NAS Fellow) | |
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| NAKAGAWA, Y. | ES51 | |
| HAN, S. M. | | University of Alabama in Huntsville |
| WU, S. T. | | University of Alabama in Huntsville |
| Numerical Study of Two-Dimensional, Non-Plane Transient Magnetohydrodynamic Flow. For publication in Computers and Fluids. | | |
| NAKAGAWA, Y. | ES51 | |
| TEUBER, D. L. | ES51 | |
| Analytical Representation of Temporal Behaviors with Finite Amplitude Fluid Transport. For publication in The Physics of Fluids. | | |
| NAKAGAWA, Y. | ES51 (NAS Fellow) | |
| WU, S. T. | | University of Alabama in Huntsville |
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| Further Development of Numerical MHD Model of Coronal Dynamics. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 15-19, 1980. | | |
| NAKAGAWA, Y. | ES51 | |
| (NRC Research Associate) | | |
| WU, S. T. | | University of Alabama in Huntsville |
| HAN, S. M. | | University of Alabama in Huntsville |

MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

- Magnetohydrodynamics of Atmospheric Transients III. Basic Results of Non-Plane Two-Dimensional Analysis. For publication in the Astrophysical Journal.
- NAUMANN, ROBERT J. ES71
Skylab and Apollo-Soyuz Experiment: Indications of the Promise of Space Processing. For presentation at the American Chemical Society Pacific Northwest Rocky Mountain Joint Regional Meeting to be held in Salt Lake City, Utah on June 12-13, 1980.
- NEIN, MAX E. PS02
WARNER, JOHN W. TA01
A Very Large Space Telescope for the Optical-UV. To be presented at the SPIE Technical Symposium East "Active Optical Devices and Applications" to be held in Washington, D. C. on April 7-11, 1980.
- NISHIOKA, G. ES74
LACY, L. ES74
FACEMIRE, B. ES74
Surface Activity in Binary Miscibility Gap Systems. For publication in the Journal of Colloid and Interfacial Science.
- NOLA, FRANK J. EC24
Power Factor Controller -- An Energy Saver. For presentation at the Textile Industry Society of the IEEE to be held in Atlanta, Georgia on May 10-11, 1980.
- NURRE, GERALD S. ED12
Space Telescope Observatory in Space. For presentation at the Rocky Mountain Guidance and Control Conference to be held in Keystone, Colorado on February 17-21, 1980.
- NURRE, G. S. ED12
DOUGHERTY, H.
Lockheed Missiles and Space Co., Inc.
- TOMPETRINI, K.
Bendix Guidance Systems Division
- LEVINTHAL, J.
Bendix Guidance Systems Division
Space Telescope, Observatory in Space. For presentation at the AIAA G&C Conference to be held in Danvers, Massachusetts on August 11-13, 1980.
- O'DELL, C. R. DS30
Scientific Management of the Space Telescope. For presentation at the SPIE Electro-Optical Technical Symposium to be held in Huntsville, Alabama on September 29-October 3, 1980.
- O'DELL, C. R. DS30
The Space Telescope. For presentation at the Optical and Infrared Telescopes for the 1990's Conference to be held in Tucson, Arizona on January 7-8, 1980 and for publication in "Telescopes for the 1980's."
- O'DELL, C. R. DS30
ASKINS, BARBARA S. ES52
Quantitative Analysis of Autoradiographic Image Intensification Using Thiourea-S³⁵. For publication in Publications of the Astronomical Society of the Pacific.
- O'DELL, C. R. DS30
BAHCALL, J. N. Institute of Advanced Study
The Space Telescope Observatory. For publication in the Journal of the Astronomical Sciences.
- OMENYI, S. N. ES73
SNYDER, R. S. ES73
Concentration Dependence of Broadening Rates of Layered Chicken Erythrocyte Suspensions. For publication in the Journal Colloid and Interface Science.
- OMENYI, S. N. ES73 (NAS Fellow)
SNYDER, R. S. ES73

MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

Effects of Zero Van Der Waals and Zero Electrostatic Forces on Droplet Sedimentation. For presentation at the American Chemical Society National Meeting to be held in San Francisco, California in August 1980.

OMENYI, S. M. ES73
SNYDER, R. S. ES73
VAN OSS, C. J.

State University of New York at Buffalo
ABSOLOM, D. R. University of Toronto
NEUMANN, A. W. University of Toronto
Effects of Zero Van Der Waals and Zero Electrostatic Forces on Droplet Sedimentation. For publication in the Journal of Colloid and Interface Science.

OMENYI, S. N. ES73
(NRC Research Associate)

SNYDER, R. S. ES73
van Oss, C. J.

State University of New York at Buffalo
Stability of Layered Erythrocyte Suspensions at Unit Gravity. For presentation at the 54th Colloid Symposium to be held at Lehigh University at Bethlehem, Pennsylvania on June 15-18, 1980.

ORAN, W. A. ES72
Capabilities of the Vacuum in the Wake of Spacecraft. For presentation at the American Vacuum Society 16th Symposium (New Mexico Chapter) to be held in Sante Fe, New Mexico on May 6-8, 1980.

ORAN, W. A. ES72
Containerless Melting and Solidification. For presentation at the Symposium of the Electrochemical Society, 157th Annual Meeting to be held in St. Louis, Missouri on May 11-16, 1980.

ORAN, W. A. ES72
Containerless Processing of Metals with

an Electromagnetic Levitation System. For publication in Metallurgical Transactions.

OWEN, J. W. EP44
VANIMAN, J. L. EP44

Thermal Control Testing for Low Cost Programs. For presentation at the Sixth Aerospace Testing Seminar to be held in Los Angeles, California on March 11-13, 1981.

OWEN, ROBERT B. ES74
Optical Measurements and Tests Performed in a Low-Gravity Environment. For presentation at the SPIE Huntsville Electro-Optical Technical Symposium to be held in Huntsville, Alabama on September 29-October 3, 1980.

OWEN, ROBERT B. ES74
CAMPBELL, C. WARREN ES74
A Laser Beam Manifold and Particle Photography System for Use in Fluid Velocity Measurements. For publication in Review of Scientific Instruments.

OWEN, ROBERT B. ES74
RILEY, CLYDE ES74
COBLE, H. DWAIN

University of Alabama in Huntsville
FISHER, GORDON
Inco Research and Development Center
Electrochemical Convectionless Transport in a Low Gravity Environment. For publication in the Journal Electrochemical Society.

POWELL, LUTHER E. PM01
25 kW Power Module. For presentation at the DGLR/AAS Symposium on Shuttle/Spacelab - The New Transportation System and Its Utilization to be held in Hannover, Germany on April 28-30, 1980.

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| <p>POWELL, LUTHER E. PM01
NASA's 25 kW Power Module — Reference System. For presentation at the 18th Goddard Memorial Symposium to be held in Washington, D. C. on March 28, 1980.</p> <p>POWERS, LUTHER B. EP25
BAILEY, RICHARD L. JPL
Shuttle Subscale Ablative Nozzle Tests. For presentation at the AIAA/SAE/ASME 16th Joint Propulsion Conference to be held in Hartford, Connecticut on June 30-July 2, 1980.</p> <p>PRIEST, C. C. PS04
NIXON, R. F. PS04
RICE, E. E. Battelle Columbus Laboratories
Space Disposal of Nuclear Wastes. For publication in Astronautics and Aeronautics.</p> <p>PRIEST, C. C. PS04
RICE, E. E. Battelle Columbus Laboratories
FRIEDLANDER, A. L. Science Applications, Inc.
U. S. Program Assessing Nuclear Waste Disposal in Space: A Status Report. For presentation at the 31st Congress of the International Astronautical Federation to be held in Tokyo, Japan on September 21-28, 1980.</p> <p>RANDALL, JOSEPH L. EC31
DECHER, RUDOLF ES61
Interferometer for Gravitational Radiation. For presentation at the SPIE's (Society of Photo-Optical Instrumentation Engineers) Symposium, East; to be held in Washington, D. C. on April 9-10, 1980.</p> <p>REDMON, JOHN W. EP34
AXAF Mirror Periscope. For presentation at the 15th Aerospace Mechanisms Symposium to be held at MSFC, Huntsville, Alabama on May 14-15, 1981.</p> | <p>RHODES, PERCY H. ES73
SAVILLE, D. A. Princeton University
Thermal Convection in a Laterally Confined Flow. For presentation at the Fluid Dynamics Meeting of the American Physical Society to be held in New York on November 23-26, 1980 and for publication in the Bulletin of the American Physical Society.</p> <p>RYAN, ROBERT S. ED21
Unstable Plume Oscillation of a High Expansion Ratio Nozzle Fired on Ground. For presentation at the Aerospace Flutter and Dynamics Council Spring Meeting to be held in Marina Del Rey, California on May 29-30, 1980.</p> <p>SAXTON, DONALD R. PS04
CALUORI, VINCENT A. Boeing Aerospace Co.
Orbital Transfer Vehicle — An Overview. For presentation at the Future Space Transportation Systems Symposium to be held in London, England on June 11, 1980.</p> <p>SCHUTZENHOFER, LUKE A. ED24
Turbulent Boundary Layer Induced Beam Stresses Simulated with a Reverberant Acoustic Field. For presentation at the 22nd Structures, Structural Dynamics and Materials Conference to be held in Atlanta, Georgia on April 6-8, 1981.</p> <p>SCHUTZENHOFER, L. A. ED23
JONES, J. H. ES23
JEWELL, R. E. ED23
RYAN, R. S. ED23
Mechanism Associated with the Space Shuttle Main Engine Oxidizer Valve/Duct System Anomalous High Amplitude Discrete Acoustical Excitation. For presentation at the 21st Structures, Structures Dynamics and Materials Conference to be held in Seattle, Washington on May 11-14, 1980.</p> |
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MSFC PAPERS CLEARED FOR PRESENTATION
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| SCHWARTZ, JONAS M. | PD24 | SMITH, R. E. | ES81 |
| HILCHEY, JOHN D. | PS02 | HUNG, R. J. | |
| The Manned Space Platform as an Evolutionary Means to Achieve a Permanent Manned Orbital Operations Facility. For presentation at the AIAA 2nd Conference on Large Space Platforms: Toward Permanent Manned Occupancy of Space to be held in San Diego, California in January-February 1981. | | University of Alabama in Huntsville
Study of GOES Infrared Digital Data of an Isolated Tornadoic Storm on May 29, 1977. For presentation at the XVII IUG Meeting to be held in Canberra, Australia on December 3-15, 1979. | |
| SCHWINGHAMER, ROBERT J. | EH01 | SMITH, R. E. | ES81 |
| Space Environmental Effects on Materials. For presentation at the AIAA/ASME/ASCE/AHS 21st Structures, Structural Dynamics and Materials Conference to be held in Seattle, Washington on May 12-14, 1980. | | JAYROE, R. R. | ES81 |
| SMITH, AUBREY D. | AT01 | WEST, G. S. | ES81 |
| Lightweight Pumping Module Adaptation for Oil Spill Cleanup. For presentation at the 1981 Oil Spill Conference to be held in Atlanta, Georgia on March 2-5, 1981. | | HUNG, R. J. | |
| SMITH, J. B. | ES52 (NOAA) | University of Alabama in Huntsville | |
| Vector Magnetic Field Measurements at Flare Locations. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980. | | PHAN, T. | |
| SMITH, ROBERT E. | ES81 | University of Alabama in Huntsville | |
| The Atmospheric Cloud Physics Laboratory. For presentation at the VIIIth International Conference on Cloud Physics to be held in Clermont, France on July 15-'9, 1980. | | LIN, D. C. | |
| SMITH, R. E. | ES81 | University of Alabama in Huntsville | |
| HUNG, R. J. | | Gravity Waves and GOES IR-Data Study of an Isolated Tornadoic Storm on May 29, 1977. For publication in Monthly Weather Review (American Meteorological Society). | |
| University of Alabama in Huntsville
Gravity Waves, Tornadoic Storms and Coupling Between Lower and Upper Atmospheres. For presentation at the XVII IUGG Meeting to be held in Canberra, Australia. | | STEINCAMP, JAMES W. | PD34 |
| | | Unified Reliability Calculations for Standard Redundancy Implementations. For publication in IEEE Transactions on Reliability. | |
| | | TANDBERG-HANSEN, E. | ES01 |
| | | STEINOLFSON, R. S. | |
| | | University of Alabama in Huntsville | |
| | | WU, S. T. | |
| | | University of Alabama in Huntsville | |
| | | DRYER, M. | NOAA/ERL |
| | | Magnetohydrodynamic Models of Coronal Transients in the Meridional Plane — III. Emerging Magnetic Flux. For cation in the Astrophysical Journal. | |
| | | STEWART, RODNEY D. | EL02 |
| | | Opening Remarks for June 3 N.E.S. Seminar on Cost Estimating. To be presented at the Cost Estimating: A Current Perspective on Techniques and Methods Conference to be held at Huntsville, Alabama on June 3, 1980. | |

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|--|------------------------|---|-------------------------------------|
| STEWART, RODNEY D. | EL02 | SWENSON, G. R. | ES53 |
| FORNEY, JAMES A. | EL02 | REES, M. H. | University of Alaska |
| Computerized Economic Analysis for DOE/NASA Sponsored Solar Heating and Cooling Programs. For presentation at the Third Annual Systems Simulation Economic Analysis/Solar Heating and Cooling Operational Results Conference to be held in Reno, Nevada on April 17-May 1, 1981. | | HAYS, P. B. | University of Michigan |
| | | The Production Efficiency of $O^+(^2P)$ Ions by Auroral Electron Impact Ionization. For publication in Geophysical Research Letters. | |
| STONE, NOBIE H. | ES53 | TANDBERG-HANSEN, EINAR | ES01 |
| The Plasma Wake of Mesosonic Conducting Bodies I: A Parametric Study of Ion Focusing by the Plasma Sheath. For publication in Plasma Physics (United Kingdom). | | CHENG, CHUNG CHIEH | ES52 |
| | | The Ultraviolet Spectrometer and Polarimeter (UVSP) on the Solar Maximum and Initial Results in Polarimetry. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980. | |
| STONE, NOBIE H. | ES53 | TANDBERG-HANSEN, E. A. | ES51 |
| SAMIR, URI | University of Michigan | WOODGATE, B. D. | NASA/GSFC |
| About the Interaction Between Rarefied Plasmas of Planetary and Interplanetary Origin and Bodies Moving in Space. For presentation at the 12th International Symposium on Rarefied Gas Dynamics to be held in Charlottesville, Virginia on July 7-11, 1980. | | The Ultraviolet Spectrometer and Polarimeter on the Solar Maximum Mission. For publication in Solar Physics (The Netherlands). | |
| STONE, NOBIE H. | ES53 | TANDBERG-HANSEN, E. | ES01 |
| SAMIR, URI | University of Michigan | WIJ, S. T. | University of Alabama in Huntsville |
| Bodies in Flowing Plasmas: Laboratory Studies. For presentation at the COSPAR Meeting to be held in Budapest, Hungary on June 11-13, 1980. | | STEINOLFSON, R. S. | University of Alabama in Huntsville |
| | | DRYER, M. | NOAA/ERL |
| | | Magnetohydrodynamic Models of Coronal Transients in the Meridional Plane. IV. Effect of the Solar Wind. For publication in the Astrophysical Journal. | |
| STOKES, JACK W. | EL15 | TAYLOR, KENNETH R. | PS06 |
| LOUGHEAD, THOMAS E. | Essex Corp. | Materials Experiment Carrier — An Approach to Expanded Space Capabilities. For presentation at the 1980 Annual American Astronautical Society Meeting to be held in Boston, Massachusetts on October 20-23, 1980. | |
| PRUETT, EDWIN C. | Essex Corp. | | |
| Development of a Cost Algorithm for Defining Manual Crew Tasks and Predicting Assembly Costs for Large Structures in Space. For presentation at the 24th Annual Meeting of the Human Factors Society to be held in Los Angeles, California on October 13-17, 1980. | | THOMAS, C. N. | FA32 |
| | | WIESENMAIER, B. L. | EE01 |

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SCHULTZ, W. E. Wyle Laboratories
HENDERSON, B. Wyle Laboratories
BANKS, M. E. Wyle Laboratories
Evacuated Tube Collectors are not Flat
Plates. For presentation at the AS/ISES
1980 Annual Meeting to be held in
Phoenix, Arizona on June 2-6, 1980.

THOMASON, HERMAN E. EA01
Skylab Reactivation and Reconfigura-
tion for Reentry. For presentation at
the IFAC Workshop on Spacecraft
System Reconfiguration in Orbit to be
held in Cambridge, Massachusetts on
September 9, 1980.

THOMPSON, JAMES R., JR. SA51
Space Shuttle Main Engine. For presen-
tation at the Seventeenth Space Congress
to be held at Cocoa Beach, Florida on
April 30-May 2, 1980.

URBAN, EUGENE W. ES63
The Spacelab 2 Pointed Experiments.
For presentation at the SPIE Los Ange-
les Technical Symposium to be held in
Los Angeles, California on February
9-13, 1981.

URBAN, E. W. ES63
KATZ, L. ES63
HENDRICKS, J. B.

University of Alabama in Huntsville
KARR, G.
University of Alabama in Huntsville
A Cryogenic System for the Small
Infrared Telescope for Spacelab 2.
For presentation at the Refrigeration
for Cryogenic Sensors and Electronic
Systems Conference to be held in
Boulder, Colorado on October 6-7,
1980.

VANIMAN, J. L. EP44
FISHER, R. R. EP44
Ablative Thermal Protection Systems.

For presentation at the International
Conference on High Temperature Corro-
sion to be held in Phoenix, Arizona on
March 2-5, 1981.

VAUGHAN, OTHA H., JR. ES83
BROOK, MARX
New Mexico Institute of Mining and
Technology

ORVILLE, RICHARD E.
State University of New York at Albany
VONNEGUT, BERNARD
State University of New York at Albany
Observations Over a Nocturnal Thunder-
storm Form A U-2 Airplane. For pre-
sentation at the Fall Meeting of the
American Geophysical Union to be held
in San Francisco, California on Decem-
ber 8-11, 1980 and for publication in
the EOS, Transactions.

VAUGHAN, O. H., Jr. ES83
VONNEGUT, B.

State University of New York at Albany
BROOK, M. New Mexico Tech.

ORVILLE, R. E.
State University of New York at Albany
Thunderstorm Overflight Program. For
presentation at the AIAA Conference
on Sensor Systems for the 80's to be
held at the U.S. Air Force Academy in
Colorado Springs, Colorado on Decem-
ber 2-4, 1980.

VAUGHAN, OTHA H., JR. ES83
BROOK, MARX New Mexico Tech.
TENNIS, RICHARD New Mexico Tech.
RHODES, CHARLEY New Mexico Tech.
KREHBIEL, PAUL New Mexico Tech.
VONNEGUT, BERNARD

State University of New York at Albany
Simultaneous Observations of Lightning
Radiations from Above and Below
Clouds. For publication in Geophysical
Research Letters.

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| VAUGHAN, O. H., JR. | ES83 | Annual Meeting of SEAS-SIAM to be held in Birmingham, Alabama on March 22, 1980. |
| HUNG, R. J. | | |
| University of Alabama in Huntsville | | |
| LIAU, G. S. | | |
| University of Alabama in Huntsville | | |
| Advection Fog Formation and Aerosols Produced by Combustion-Originated Air Pollution. For presentation at the 2nd Joint Conference on Application of Air Pollution Meteorology to be held in New Orleans, Louisiana on March 24-27, 1980. | | |
| VAUGHAN, OTHA H. | ES83 | |
| VONNEGUT, B. | | |
| State University of New York at Albany | | |
| BROOK, MARX | | |
| New Mexico Tech. | | |
| Nighttime/Daytime Optical Survey of Lightning and Convective Phenomena Experiment (NOSL). For presentation at the VIIth International Conference on Atmospheric Electricity to be held in Manchester England on July 28-August 1, 1980. | | |
| VERBLE, A. J. | EP31 | |
| CONNELL, H. A. | EP34 | |
| CLARK, A. V. | EP34 | |
| Release Mechanism (REM) for Releasing and Reattaching Experiments on the Space Shuttle. For presentation at the 15th Aerospace Mechanisms Symposium to be held at MSFC, Huntsville, Alabama on May 14-15, 1981. | | |
| VILLELLA, F. | EC43 | |
| HAMITER, L. | EC43 | |
| Semiconductor Stress Testing at High Temperature. For presentation at the International Society for Testing and Failure Analysis to be held in Los Angeles, California on October 27, 1980. | | |
| WAITES, HENRY B. | ED12 | |
| Observation Without Plant Input Information. For presentation at the Fourth | | |
| Annual Meeting of SEAS-SIAM to be held in Birmingham, Alabama on March 22, 1980. | | |
| WAITES, HENRY B. | ED12 | |
| An Observer for a Deployable Antenna. For presentation at the AIAA 2nd Conference on Large Space Platforms: Toward Permanent Manned Occupancy of Space to be held in San Diego, California in January/February 1981. | | |
| WARMBROD, JOHN D. | ED33 | |
| Design and Development of the Thermal Protection System for the External Tank. For presentation at the Aero-thermal Workshop to be held in Colorado Springs, Colorado on March 17, 1980. | | |
| WARNER, JOHN W. | TA02 | |
| Super Size Telescope. For presentation at the SPIE Technical Symposium to be held in Washington, D. C. on April 10-11, 1980. | | |
| WEATHERS, HOYT M. | FA33 | |
| Study of Dispersed Applications for Solar and Wind Energy Systems. For presentation at the Solar Energy Seminar and U. S. Trade Show to be held in Sao Paulo, Brazil on November 5-7, 1979. | | |
| WEAVER, E. A. | EC32 | |
| BILBRO, J. W. | EC32 | |
| DUNKIN, J. A. | EC32 | |
| JOHNSON, S. C. | EC32 | |
| JONES, W. D. | EC32 | |
| Pulsed Doppler Lidar for Detection of Turbulence in Clear Air. For presentation at the NASA Aircraft Safety and Operating Problems Conference to be held in Hampton, Virginia in November 1980. | | |
| WEAVER, EDWIN A. | EC32 | |
| The 1979 Clear Air Turbulence Flight | | |

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Test. For presentation at the Aircraft Safety and Operating Problems Conference to be held in Hampton, Virginia in Mid-November 1980,

WEISSKOPF, MARTIN C. ES62
The Advanced X-Ray Astrophysics Facility (AXAF). For presentation at SPIE's Technical Symposium East "Active Optical Devices and Applications" to be held in Washington, D.C. on April 7-11, 1980.

WEISSKOPF, M. C. ES62
X-Ray Astronomy. For publication in the AIAA Proceedings of "Shuttle to the Next Space Age."

WEISSKOPF, M. C. ES62
DARBRO, W. ES62
ELSNER, R. ES62 (NAS/NRC Resident)
GHOSH, P. ES62 (NAS/NRC Resident)
SUTHERLAND, P. G.

Alfred P. Sloan Fellow

GRINDLAY, J. Alfred P. Sloan Fellow
High Time Resolution Observation of the Transient Event of 5 March 1979. For publication in Nature.

WEISSKOPF, M. C. ES62
DARBRO, W. ES62
ELSNER, R. F. ES62
GHOSH, P. ES62
SUTHERLAND, P. G. ES62
GRINDLAY, J. E. ES62

Observations of 4U1626-67 With the Monitor Proportional Counter on the Einstein (HEAO-2) Observatory. For presentation at the AAS High Energy Astrophysics Division Conference to be held in Cambridge, Massachusetts on January 28-30, 1980 and for publication in the AAS Bulletin.

WEISSKOPF, M. C. ES62
ELSNER, R. F. ES62 (NAS/NRC)
GHOSH, P. ES62 (NAS/NRC)

DARBRO, W. ES62
GRINDLAY, J. E.
Harvard-Smithsonian Center for Astrophysics
MARSHALL, H. L.
Harvard-Smithsonian Center for Astrophysics
HERTZ, P.
Harvard-Smithsonian Center for Astrophysics
SOLTAN, A.
Harvard-Smithsonian Center for Astrophysics
Time-Resolved Imaging and Spectral Studies of an X-Ray Burst from the Globular Cluster Terzan 2. For publication in the Astrophysical Journal Letters

WEST, E. A. ES52
HAGYARD, M. J. ES52
SMITH, J. ES52

Interpretation of Filter Magnetograph Results Including Solar Magneto-Optical Effects: Observations. For presentation at the 156th Meeting of the American Astronomical Society to be held in College Park, Maryland on June 16-19, 1980.

WOJTALIK, FRED S. EE01
Project HEAO - Revisited. For presentation at the Eighth IFAC World Congress to be held in Kyoto, Japan on August 21-28, 1981.

WYMAN, CHARLES L. EE01
WEISSKOPF, MARTIN ES62
ZOMBECK, MARTIN V.

Harvard-Smithsonian Center for Astrophysics
High Resolution X-Ray Scattering Measurements for AXAF. For presentation at the SPIE Huntsville Electro-Optical Technical Symposium to be held in Huntsville, Alabama on September 29-October 3, 1980.

YOST, VAUGHN H. EE05
A Review of Equipment Developed for Materials Processing in Space. For presentation at the First Annual Get Away Special Users Symposium to be held at

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the USAF Academy at Colorado Springs,
Colorado on November 28-30, 1979.

YOUNG, L. E. **EC12**
Solar Array Technology for Solar Electric Propulsion Missions. For publication in AIAA Progress in Astronautics and Aeronautics.


ZOLLER, LOWELL K. **LA01**
NASA's Materials Processing in Space Program. For presentation at the Eighteenth Goddard Memorial Symposium to be held in Washington, D. C. on March 27-28, 1980.

APPROVAL

FY 1980 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

Compiled by O. L. White

The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or Atomic Energy Commission programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.


JAMES T. MURPHY
Director, Administration and Program Support